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SURGICAL TREATMENT FOR IRIDOCYCLITIS

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Whereas in cases of acute iridocyclitis an operation is rarely necessary, it is unforunately only too often unavoidable in chronic cases. I say "unfortunately" because an operation on a chronically inflamed eye is always an unpleasant task for the physician. A diseased eye sometimes will not tolerate even a very slight operation, which may lead either to an exacerbation of the uveitis that was already present or to a fresh attack. Indeed, atrophy of the eye may be a direct sequela of the operation; this is particularly true of extraction of a cataract. In such cases there need not even be an especially severe inflammation after the operation. One rather has the impression that the eye is simply too weak and does not have the necessary reserve strength to refill the contents of the eye after they have been reduced by the operation. The following rule must therefore be followed: Patients with active iritis should be operated on only as an urgent measure for saving the eye, and only the most sparing and least radical operation should be performed.

In reviewing the operations that must be used in cases of iritis, one might divide them into those that are intended to combat rises in pressure and those that are carried out for optic reasons.

OPERATIONS FOR REDUCING AN INCREASE IN PRESSURE

An increase in pressure in iritis may occur in the following cases: (*a*) In acute cases the chamber is usually deeper in the affected eye than in the other eye. In such cases strong instillations of atropine and possibly an intragluteal injection of milk are indicated; otherwise, an operation is not necessary.

In especially severe cases of acute iritis in which not even injections of milk can relieve the pains and the inflammation and in which the eye feels harder than normal, there is the temptation to drain the aqueous humor and the exudation by paracentesis of the cornea. One wishes to relieve the eye and to supply it with fresh defensive material by the formation of new aqueous humor. However, the operation is not satisfactory in these cases. It is extremely painful, since the eye cannot be properly anesthetized, and the fixation of the eyeball and the discharge

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of the fluid cause severe pain despite all injections. As a rule, during or after the paracentesis a hemorrhage occurs in the anterior chamber from the overfilled vessels of the iris, which by no means betters the state of the illness. I always regard such hemorrhages in cases of iritis, whether they occur after operation or spontaneously, as a complication. They never mark the beginning of a change in the course of the disease or an improvement. This has also prevented me from injecting the patient's own blood into the anterior chamber, even though there may be an essential difference between blood from the cubital veins and that in the diseased iris.

In such cases of very severe acute "rheumatic" iritis, which did not even react to injections of milk, I have had my best results, and these were sometimes surprisingly good with large doses (from 4 to 5 cc.) of strong chiniofon, N. N. R., with casein, when injected into the glutei muscles.

(*b*) In cases of chronic iritis with a very gradual course the increase in pressure may be due to a total adhesion of the pupillary border to the lens (annular posterior synechia), which later leads to the clinical picture of umbrella iris (iris bombé). In Austria this picture of disease has become relatively rare since a preventive iridectomy is usually performed in time, i. e., before the pupillary border has completely grown together with the lens, to ward off glaucoma. This operation is performed in cases of chronic iritis when only one or two small parts of the pupillary border are found to be still free after the instillation of atropine and it is feared that these free areas might also be shut by new synechias at the next attack of iritis, thus interrupting the communication between the posterior and the anterior chamber (seclusio pupillae).

Iris bombé, the result of a seclusio pupillae, is common in countries where ophthalmologists are rare or nonexistent, and I have often found this condition in both eyes in Chinese. Umbrella iris is almost always associated with a rise in pressure, and the eyes usually show ciliary injection and are often also painful.

There are also severe cases of chronic iritis in which the eye is soft despite an umbrella iris, i. e., in which so little fluid is produced that there is no increase in pressure even though the iris is protruded. According to Verhoeff, only a very small difference in pressure between the anterior and the posterior chamber is sufficient to push the iris forward. I usually do not operate in cases of umbrella iris if the eyes are soft, since the softness of the eye indicates an especially severe inflammation of the ciliary body, and such eyes react badly to an operation.

During a preventive iridectomy on eyes with annular synechia but without seclusio pupillae, a hump-shaped protrustion of the iris which had been in normal position before is sometimes seen directly after

the aqueous has flowed off. This is quite a surprise for the surgeon who sees it for the first time, but can be easily explained. Through the discharge of the fluid, the pressure in the anterior chamber becomes very low; the fluid in the posterior chamber also attempts to flow off, but can do so only very slowly through the small remaining openings in the rim of the pupil; the resulting difference in pressure in the anterior and the posterior chamber causes protrusion of the iris. The performance of the iridectomy is naturally not impeded in this way, and the operation is continued smoothly.

The operative treatment for iris bombé depends on whether parts of the chamber are still left in the periphery, i. e., whether the hump-shaped protrusion has only started or whether it has progressed so far that the angle of the chamber is completely closed. In the former case, an iridectomy is performed. This is best carried out on the upper part of the eye, as is also the preventive iridectomy, so that the coloboma is covered by the lid.

If the hump-shaped protrusion of the iris is so far advanced that there is no longer room for the introduction of the lancet, classic transfixion, which was worked out by my father, E. Fuchs, should be carried out. With a small Graefe knife, the iris is punctured four times in the horizontal meridian. The cornea is punctured near the temporal limbus; the knife is then held parallel to the original position of the iris and is passed in front of the lens through the iris, the pupil and again through the iris, the contrapuncture in the cornea being made on the opposite side. In this way four holes are made in the iris, which falls back into its original position, and the increased pressure disappears if the umbrella iris has not been present for more than fourteen days.

In cases of iris bombé of long standing, however, the peripheral part of the iris has grown together with the cornea; the iris returns after the transfixion to its original position, but the peripheral anteroposterior synechia prevents the discharge of the aqueous humor in the anterior chamber through the canal of Schlemm, and the increased pressure remains.

About a week or two after the transfixion, it is advisable to carry out an iridectomy, since the four small holes in the iris might easily close if there was another attack of inflammation.

I have often used the following method to spare the patient two operations: I first perform a partial transfixion (fig. 1), pushing the Graefe knife from the temporal side only through the external half of the iris until the tip of the knife appears in the pupil, and then drawing it back quickly. The liquid in the posterior chamber equalizes with that in the anterior chamber, and the whole of the iris returns to its original position, although the aqueous humor does not escape. In this way one obtains a normal anterior chamber, and an iridectomy can be carried

out at once, although with some precaution. Iridectomy cannot be carried out immediately after a complete transfixion, since the fluid flows off and the eye is soft and without an anterior chamber.

In cases of umbrella iris, an iridectomia ab externo (Salzmann) can also be carried out. Since this operation is little known and practiced and offers some important advantages, I shall describe it in more detail.

The principle involved was first stated by Gayet and Dianon in 1884, and the operation was later applied by Elschnig and Zorn in all cases of glaucoma. Salzmann [1] gave the method its final form and its name of iridectomia ab externo, and performed it in a large number of cases. I have found this operation so valuable in cases in which there is severe inflammation of the eye that I can recommend it most warmly and point out here its three main advantages. It has become much less painful, considerably simpler and easier and much less dangerous than the classic iridectomy with a lancet or a knife.

After the usual anesthesia and akinesia, a subconjunctival injection of procaine hydrochloride (0.5 cc. of a 4 per cent solution) is made

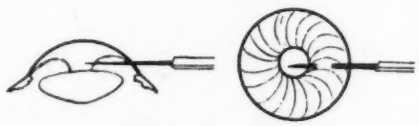

Fig. 1.—The steps in partial transfixion.

into the upper part of the eye, and in restless patients a bridle suture is passed through the superior rectus muscle. A broad conjunctival flap is then dissected out up to the upper limbus, as in the Elliot trephining. The flap is then turned down over the cornea, and the sclerotic is scratched 1 mm. behind the limbus and parallel to it for about 7 mm., the tip of the lancet being used (fig. 2). The blade of the lancet is kept perpendicular to the surface of the cornea. The incision through the sclerotic is deepened by scratching back and forth in the premarked groove, the eyeball being held in place by the turned down conjunctival flap, and the blood wiped away with a bit of cotton after each incision. Then suddenly the sclerotic is perforated at one spot; a small prolapse of the iris results, but the aqueous humor does not flow off. A drop of cocaine is applied to the prolapsed sclerotic, and the sclerotic wound is cut wider open to both sides of the prolapsed area, until the opening is 5 or 6 mm. long. The incisions are made only with the tip of the lancet, and no instrument is introduced into the eye itself during the operation. After the instillation of a few more drops of cocaine, the prolapsed iris is drawn forward and to the side and is excised with several clips of the de Wecker scissors, which are pressed against the

1. Salzmann, M.: Ztschr. f. Augenh. **72**:127, 1930.

sclerotic wound. At this point, the whole of the aqueous liquid flows off. It should be added that the iris must be drawn out fairly energetically. Reposition of the iris is effected by massaging the edges of the wound with the spatula, and the branches of the coloboma are extended in this way, the conjunctival flap is stroked back, and the operation is at an end.

The after-treatment is very simple. Atropine is given with good results, and the anterior chamber is sometimes abolished for several days. The operation is usually carried out in cases of acute primary glaucoma, and its end-results are excellent; in some cases a cystoid scar results, in others the scar is flat and solid. In both kinds of scar, however, the pressure seems to be permanently regulated, so far as this can be judged after two years of experience. The operation also

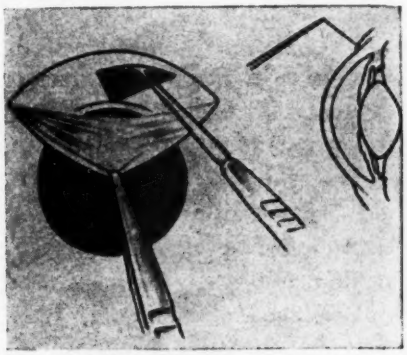

Fig. 2.—Method of iridectomy.

offers many advantages in cases of secondary glaucoma, especially when the anterior chamber is very shallow or obliterated.

Physicians who are acquainted with the difficulty and painfulness of an iridectomy in cases of severe acute glaucoma will be astonished at the simplicity, ease and painlessness of iridectomia ab externo. I should like to point out three more advantages of the operation in addition to those mentioned by Salzmann:

The first advantage is the ease with which the eyeball can be fixated. The eye is drawn down by the flap. Scratching back and forth on the sclerotic with the lancet requires no such firm fixation as, for example, boring through the sclerotic with a lancet or with Graefe's knife, whereby there is always danger of hurting the lens on sudden perforation with the knife.

A second advantage is that there is practically no bleeding during the operation once the superficial bleeding has been stopped. Above all, one is not disturbed by the prolific bleeding that is so often one of the difficulties of iridectomy with Graefe's knife. Even after the

excision of the iris, the anterior chamber does not as a rule fill with blood, and the reposition of the branches of the coloboma can usually be made without trouble.

A third important advantage is that the operation seems to be much less severe for the eye; the eye recovers much more quickly, the ciliary injection disappears much sooner, and complete healing takes much less time.

The only difficult, and at the same time the most important, step of the operation is that the prolapsed iris must be drawn with energy forward and toward the corner of the wound, and that the scissors must be pressed against the sclerotic and at the same time the iris cut off in several clips of the scissors. If this is done correctly, the iris recedes as surprisingly well as it does with the Elliot operation.

The advantages of the operation of iridectomia ab externo, according to Salzmann, are so great for the patient and the surgeon that it can be recommended highly.

If the pressure on the eye remains high after transfixion or iridectomy, although the iris seems to have regained its normal position, this is due, as has already been said, to a peripheral anterior synechia, and if the eyeball is carefully examined, the peripheral part of the anterior chamber will be found to be shallower than normal. In such a case, either an anterior sclerotomy or a cyclodialysis will be necessary, although the latter is always an unpleasant operation in cases of chronic iridocyclitis, as I shall make clear later.

In some cases of severe iridocyclitis a partial hump-shaped protrusion of the iris is found, i. e., the iris is protruded at some points, while at others the anterior chamber is deeper than normal. This is because part of the iris forms flat adhesions with the lens (total posterior synechia) as the result of the cyclitic exudate and therefore cannot be pushed forward at these points, whereas other nonadherent parts of the iris tend to be pushed forward. Histologically, one often finds in these cases that the pigmented epithelium has in some places formed flat adhesions with the lens, and that the choked aqueous humor has torn off and pushed forward the stroma of the iris with the dilator fibers from the pigmented epithelium.

In these cases the iridectomy must not be performed at places where the chamber is abnormally deep in the periphery, because there is a flat adhesion, but the incision with the lancet is best made where the hump of the iris passes over into the total posterior synechia. There one has room to introduce the lancet, and there the iris is free, so that it can be easily drawn out and cut off.

Special care must be taken of total synechias in cases in which preventive and optic iridectomies are performed.

(*c*) Not very common but especially important cases of increased pressure are those due to iritis serosa; there are no posterior synechias, only deposits on the posterior wall of the cornea; the vitreous humor is often clear, and vision is normal. The tendency toward an increase in pressure often betrays itself early in that the pupil of the diseased eye is wider than that of the other eye, whereas in cases of iritis the pupil is usually narrower. After the ailment has been present for a long time, a period of increased pressure may set in more or less suddenly. It is usually gradual in its development and causes few symptoms; I have often seen cases in which one eye had become blind because of glaucoma due to iritis serosa and showed a total excavation, whereas the pressure in the other eye was still normal. Some years later, the normal eye would also show signs of increased pressure. The patient sometimes calls attention to this by complaining of occasional filming of the ailing eye, but sometimes he complains only of a lessening of his visual capacity. The tonometer should always be used, however, when a widening of the pupil, the sign of increased pressure, is observed.

What can be done in cases of gradual increases in pressure in iridocyclitis? Cyclodialysis is inadvisable in all cases in which a disease of the ciliary body must be assumed. The detachment of an inflamed and infiltrated ciliary body may only too easily bring about an acute exacerbation. Besides, these cases are certainly not caused by an anterior synechia, but by an overproduction of aqueous humor.[2] This seems to me all the more likely because increases in pressure occur in cases of cyclitis and keratitis especially when a period of hypotension has been present previously.

The application of a fistula, as in Elliot's operation, seems to be most advisable to combat the excess production of aqueous humor. Unfortunately, however, in all eyes in which a process of inflammation is active, a trephination opening closes too soon. In these eyes, the aqueous fluid contains more protein, and fibrin clots form more easily and are naturally deposited in the trephination opening, leading to the organization of cicatricial tissue and to closing of the opening.

The increases in pressure found in cases of iritis serosa are extremely stubborn, but show the pleasant feature that, after a certain period, e. g., from one half to three fourths of a year, they usually get better. It is therefore necessary to tide over this bad period in such a way that not too much of the visual field and of the vision is lost. A great deal of patience on the part of the surgeon and the patient is therefore necessary. I have several times had the pleasure of saving the second

2. It is naturally also possible that colloids which are difficult to discharge from the eye develop in the aqueous humor at a certain time because of the inflammation, and that these are responsible for the congestion.

eye of patients who have lost the sight of one eye despite single or repeated operations. In these cases the second eye entered the period of increased pressure several years later, and sometimes as many as eighteen and more operations for relief of pressure were necessary to save it. Usually, I first only puncture the eye, and repeat this several times. After puncture, the eyes are usually much softer than normal, which is proof that the aqueous humor apparently takes up much more room than in a normal eye. If the puncture is not sufficient, iridectomy is then carried out, and if the pressure rises again, one or more Elliot trephinings are performed. The latter usually help for five or six weeks, and then one usually has to operate again. An anterior sclerotomy may also be of help for a time, but the wound soon closes again for the same reasons as the wound made by the Elliot trephining.

After I had observed in several cases that even greater operations were not permanently successful, I tried to reduce the pressure for a long period by puncture; if the reduced pressure that follows lasts for eight days or more, I repeat the puncture, but if it lasts for a shorter time I perform one of the operations mentioned.

Increases in pressure that are just as difficult to combat are also found in cases of scleritis, and these are also due to disease of the ciliary body. They distinguish themselves, however, from those found in cases of iritis serosa in that they are usually more malignant and do not improve after a certain period, but cause blindness much more often.

(*d*) I shall mention one more type of severe increase of pressure due to iritis. It is rare and occurs as a result of diabetes, if an operation for cataract has previously been performed. Several weeks or months after a successful extraction, the patient presents the picture of severe iritis with a considerable increase in pressure. In these cases I do a puncture, which improves the condition greatly. The iritis also disappears, the eye becomes soft, and the vision is again normal. Unfortunately, these attacks recur at intervals of several weeks until the eyes are ruined, and not even greater operations can save the patient's sight.

OPERATIONS FOR OPTIC REASONS

Dulness of the cornea, coatings on the posterior wall of the cornea, exudation into the pupil and opacities of the vitreous humor are the optic disturbances that occur in cases of "fresh" iridocyclitis. After the fresh symptoms have subsided, there are mainly three optic disturbances with which one has to deal in cases of chronic iritis, i. e. changes in the pupillary membrane, complicated cataracts and vitreous opacities.

(*a*) The pupillary membrane, which is produced from an organized exudation, is sometimes so connected with the rim of the pupil that it is

difficult to determine whether only a pupillary membrane or also a complicating cloudiness of the lens are present. This distinction has become much easier, however, since the introduction of the slit lamp, and the indication can be determined with much greater certainty. Once part of the iris has been caused to recede by a few drops of atropine and epinephrine, it is easy to determine with the ophthalmoscope whether a clouding of the lens is present, and also the possible improvement of vision after an optic iridectomy by testing the vision.

Optic iridectomies are otherwise undertaken toward the outside or the outside and lower part in cases of leukoma of the cornea. In cases of chronic iritis it is sufficient to make a small hole above the pupillary membrane. Since the pupil is narrow in cases of iritis, especially when there has been no previous treatment, the pupillary membrane covers only a small area, and the optic iridectomy can be performed above, because there is enough room between the pupillary membrane and the edge of the upper lid to see through well (fig. 3); moreover, the blinding which comes through the coloboma is lessened. Besides, it must be

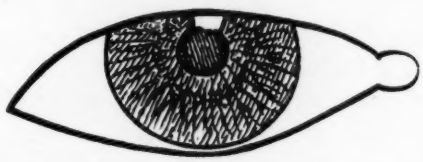

Fig. 3.—Drawing showing the hole between the pupillary membrane and the edge of the upper lid.

remembered that relatively often cloudiness of the lens will later make extraction necessary, so that it is better to carry out the optic iridectomy upward or outside and upward so as to have a convenient coloboma for a later extraction.

In general, it does not matter whether the optic iridectomy is performed in the region where the rim of the pupil is still free or in some other place where the iris is fixed to the lens. The iris can as a rule be easily drawn out from an adherent spot, although pigment usually remains behind on the lens at the site of the posterior synechia and the pupillary border. Generally, there is still a free hole in the upper part of the pupillary rim, so that the iridectomy performed on the upper part fits in very well with the plan.

One should not perform an optic iridectomy in the region of a total posterior synechia. The iris cannot as a rule be properly drawn forward with the forceps, the diseased tissue always tearing through, and even if a piece of the iris is successfully removed and the coloboma appears black, the slit lamp will later show that pigment has remained adherent to the capsule of the lens, and the optic effect of the operation is slight.

If one sees with the slit lamp that there is no marked cloudiness of the lens, but if a thickening of the capsule of the lens can be seen near the pupillary border, it is probable that a diffuse cloudiness of the lens will be found after an optic iridectomy, frustrating any considerable improvement of vision and making a later extraction necessary.

(*b*) Complicated cataract is often a problem for the ophthalmologist. Extraction is often difficult because of adhesion of the iris to the capsule of the lens, and sometimes because of adhesions between the ciliary body and the lens. Moreover, the vitreous humor is frequently involved, and often liquefied. Also, newly formed vessels on the surface of the iris sometimes cause considerable bleeding, which later causes, together with the remains of the lens, the formation of thick membranes due to the inflammation of the eye.

The lens of an eye affected with chronic iritis should be extracted only when the process of inflammation has completely run its course and when there are no longer any signs of a fresh exudation or infiltration.[3] If precipitates or a slight dulness of the cornea is present, if there are changes in the endothelium or gray nodules in the iris or if there is hypotension or hypertension, the extraction must absolutely be avoided, and the eye should be given at least from one-half to one year of complete rest. An earlier operation may only too easily lead to ruin of the eye.

Before the invention of the slit lamp, it was often difficult to decide whether a visual disturbance in a case of chronic iritis was due to an opacity of the lens or of the vitreous humor, especially when the pupil was very narrow and could not be widened. This distinction can be much more easily made with the slit lamp; i. e., one can determine whether the lens is clouded to any great extent or whether only an opacity of the vitreous humor is causing the visual disturbance. If the lens is clouded, it is naturally impossible to say anything definite about the vitreous humor, which can also be clouded. It may thus happen that the vision is not improved after a successful extraction of the lens because the vitreous humor was also filled with opacities in addition to the complicated cataract.

In some cases in which only slight cloudiness of the lens is seen with the slit lamp, relatively bad vision is a certain sign of the presence of thick opacities of the vitreous humor. This observation requires a certain amount of experience.

Opacities of the vitreous humor are usually discharged by the posterior part of the ciliary body, and the pressure of the eye is usually lowered with severe disease of this part. In these cases the tension of the eye should be tested with special care, and if there is the slightest

3. Also then histologically one always finds foci of lymphocytes in the uvea.

lowering of pressure the operation should be postponed until the eye has been under normal pressure for a half or a whole year.

In cases of cataract complicating chronic iritis, I always perform a preparatory iridectomy. I do this first to see how the diseased eye responds in general to an operation, second to make the extraction simple and easier, and third to avoid bleeding if possible during the operation for extraction. There are frequently new-formed vessels, consisting only of an endothelial tube, on an atrophic iris, and these often bleed when the iris is cut through. If parts of the lens and blood remain after the extraction, it is much more likely that a thick membrane will be formed than when no blood remains. If a preparatory iridectomy has preceded the operation for cataract, it is possible that the extraction can be carried out entirely without hemorrhage, and either no secondary membrane is formed or only a very thin one appears which can later be easily removed.

In general, I consider it better to extract this type of complicated cataract, not in the capsule, but in the usual way. The reason is: If the lens is drawn out in the capsule, it may happen only too easily that the ciliary processes are pulled on through adhesions, and this either may lead to bleeding or may stir up the latent inflammation. I have the impression that the eyes respond more easily to the intracapsular operation for cataract with atrophy of the eyeball. The old method of extraction sometimes leaves parts of the lens, but these disappear completely if the anterior capsule has been broadly opened, if hemorrhage has been avoided by a previous iridectomy and if absorption is accelerated by the application of hot compresses and ethylmorphine hydrochloride and injections of protein.

I undertake an intracapsular operation only if the complicated cataract is greatly shrunken and the capsule is very thick.

The membranes which develop after extraction of a cataract are the rarest of optic disturbances. I have shown how the eye should be operated on as sparingly as possible and how the formation of a membrane can be prevented. Eyes with fresh symptoms should not be operated on, hemorrhage should be avoided, and a preparatory iridectomy should be performed.

If a delicate membrane is found, a discission should be performed; this should be done with two needles through the cornea, an assistant fixating the eye. Both needles are thrust 2 mm. from the limbus through the cornea, and the middle of the membrane is perforated (fig. 4); the edge of the needle is turned toward the ciliary body, and the incision is made from the central point toward the pupillary margin. It is important that both the tip and the edge of the needles be perfectly sharp, so as to avoid any possible pull on the ciliary processes. These processes are often connected with the sac of the capsule

by fine cords, and any dragging on the ciliary body may lead to atrophy of the eye, as already pointed out.

If a thicker membrane has formed, it is a sign that the inflammatory process in the eye was very severe, and again the rule is to exercise patience and wait at least a year. Then the most sparing operation is again the most suitable. If the membrane has shrunk and pulled the pupil upward, a hole can often be made by a radial incision into the iris beneath the membrane (iridotomy); this is often easier than making a hole in the membrane itself, which is much firmer and much more resistant than the atrophic iris.

All methods for cutting a thick membrane with the scissors are quite dangerous, and it should always be remembered that any drag on the ciliary body must be avoided.

(*c*) Opacities of the vitreous humor must be regarded as the worst optic disturbances in cases of chronic iridocyclitis. In most cases they

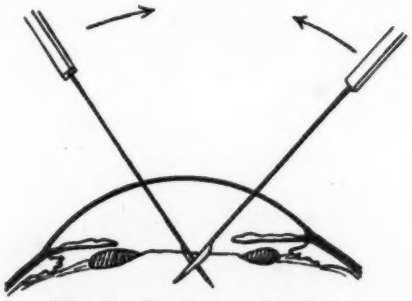

Fig. 4.—Method of discission.

consist of exudate cells discharged into the vitreous humor by the ciliary body; they are absorbed slowly or not at all. Fresh opacities of the vitreous body should be treated with conservative methods, but not by operation. If the opacities of the vitreous body are very old and if all other signs of an inflammation in the eye are absent, both in the anterior section and in the fundus, suction of the vitreous humor according to the technic of zur Nedden may be performed. This suction was at one time used often, but now little is heard about it. However, in cases in which there is no particular danger of a detachment of the retina and in which the aforementioned conditions are fulfilled, the suction of from 0.3 to 0.5 cc. of vitreous humor through the sclera in the region of the ora serrata with a needle that is not too fine, is very sharp and has a fine point may have good optic results without causing any disadvantages. But since thick opacities of the vitreous humor are but the expression of a severe disease, the drainage can attempt only to relieve a symptom and not the disease itself, which is sometimes made worse by the treatment.

COMMENT

The great variety of complications in cases of chronic iridocyclitis corresponds to the diversity of indications and methods. For all operations, an understanding of the pathologic process involved is necessary. The surgeon who has frequently seen slides of quite old cases of iridocyclitis with the iris still full of plasma cells and with round cell infiltrates in the ciliary body will be much more careful and reserved in operating on eyes so affected than one who knows little of these things. The study of pathologic anatomy is the surgeon's guide here as in the whole field of surgery, and it must be recommended to every surgeon with the greatest urgency.

SEBORRHEAL BLEPHARITIS

WITH A NOTE ON THE VALUE OF ROENTGEN THERAPY IN ITS CHRONIC STAGES

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The blepharitides constitute, essentially, inflammations of all the elements comprising the margins of the lids, namely, the skin, hair follicles and glandular apparatus. Aubaret [1] provisionally divided them as follows:

1. Cutaneous Types: (*a*) A group comprising pruritus and prurigo of the margins of the eyelids, and hyperemias and urticarias of the lids.

(*b*) A second group comprising the eczemas, eczematized conditions, impetigos and psoriasis. The definition for eczema or dermatitis (the two terms are synonymous) is that it is a cutaneous reaction, the result of irritants brought to a prepared or predisposed skin from within or without. The external agents may be mechanical, physical, chemical or parasitic.

2. Glandular Types: Normally, the secretion of the glands of the palpebral border is of a mixed but strongly greasy character. Here may be considered seborrheic blepharitis, meibomian blepharitis and sudoriparous blepharitis.

This is an arbitrary classification, as it is admittedly difficult to demonstrate to what degree the different glandular parts are affected when one of them is actually the original site of the trouble. However, the meibomian glands are identical in structure with sebaceous glands and are a variety of cutaneous sebaceous glands.

3. Follicular Types: These types often progress to ulcerative forms. Pyogenic organisms play as important a part in this as does the special predisposition that is always present. Staphylococcus pyogenes-aureus is the common offender, and the clinical conditions vary from a simple folliculitis to sycosis vulgaris and furuncles. Such a type may be superimposed on a cutaneous or glandular type.

Read before the Section on Ophthalmology, College of Physicians of Philadelphia, Oct. 19, 1933.

From the Department of Dermatology and Syphilology of the Graduate School of Medicine of the University of Pennsylvania.

1. Aubaret: Presse méd. **47**:770, 1929.

Aubaret [2] likewise noted an acneform folliculitis which follows dietary excess; also blepharitis in the course of eruptive diseases as well as those conditions due to syphilis, tuberculosis, leprosy, Acarus scabiei, Demodex folliculorum and refractive errors.

The type of marginal blepharitis with which I am especially concerned is primarily the seborrheic one. The condition is exceedingly common, and although not serious, is for many in its chronic or advanced stage embarrassing, annoying and disfiguring. So far as the ophthalmologist is concerned, it is, in many instances, a minor complaint, but to a large number of these patients it represents an important annoyance locally and mentally. Any remedy having the slightest influence on its course is worthy of trial.

My claim as a dermatologist to any interest in this form of marginal blepharitis rests largely on the fact that it is frequently associated with the well known cutaneous disturbance seborrheic dermatitis.

In treating the general disturbance of the skin of four patients with seborrheal blepharitis, I became interested in determining just what effect a physical agent such as the roentgen rays would have on those lids which had been neglected or unsuccessfully treated for a long time with chemical agents. There was an added reason for determining this from the fact that the chemical agents successfully used by dermatologists on the skin are difficult to use on the margins of the eyelids because when the preferable ones accidentally enter the ocular sac they usually irritate the conjunctiva. Three years ago, Aubaret,[2] in discussing physical therapy for the blepharitides, mentioned among other agents the roentgen rays but did not think that any of the measures are of great value by themselves.

My object, therefore, in presenting this paper is to call attention to the beneficial results which may be obtained with physical agents in some instances of chronic seborrheal marginal blepharitis and especially those of long standing due partly to resistance to chemical agents and partly to neglect.

I believe it to be proper to outline the point of view of the dermatologist with respect to the origin, nature and course of this type of marginal blepharitis. Although such inflammation may be limited to the margins of the eyelids without cutaneous lesions elsewhere, it most frequently is accompanied by evidences of seborrheic dermatitis in one or all of the following locations: the scalp (or in this situation by its forerunner, pityriasis simplex or dandruff); behind or on the ears; in the eyebrows; on the face, especially around the wings of the nose; on the chest over the sternum; between the scapulae, and elsewhere. Furthermore, many

2. Aubaret, E.: Blepharitis, Arch. Ophth. **3**:762 (June) 1930.

of these patients show a premature baldness which is but an end-result —a scar, as it were, produced by the action of the disease on the hair follicles. Sabouraud's [3] explanation of the origin and development of seborrheic dermatitis, irrespective of its location, is commonly the accepted one.

"Dandruff" eczema of the margins of the eyelids is not an infrequent disease. It is a condition that usually develops early in life, around the tenth to the twelfth year, and oftener in the male than in the female. It often appears to be hereditary and is certainly familial because the presence of more than one case in a given family is not an uncommon finding. It is probable that the disease itself is not hereditary but that the lack of resistance to its development is. Dandruff eczema of the eyelids, like dandruff eczema elsewhere, is an infectious disease which is now generally believed to be due to a fungus, Pityrosporon of Malassez (bottle or flask bacillus of Unna), which derives its food from

Fig. 1 (case of Zentmayer).—Chronic blepharitis of ten years' duration.

the sebum or the sebaceous secretion. This parasite is usually found living on the skin in symbiosis with two other organisms, the morococcus of Unna (gray coccus of Sabouraud) and the acne bacillus of Unna (microbacillus of Sabouraud). The disease has been reproduced by dermal implantation and intracutaneous injections of the pityrosporon.

In the beginning of a marginal seborrheic dermatitis, only dry, grayish scales are visible. Fine flakes appear that cling loosely to the eyelashes; there is apparently a continuous exfoliation of the epidermis and red border of the lids. The onset of this scaling or pityriasis (from the Greek meaning branlike) is insidious. New scales form as old ones fall. In this stage the scaliness constitutes the entire disease, and no redness, i. e., evidence of inflammatory phenomena, is present. There may or may not be itching. In some cases only one or two scales on one eyelid are present; in others, the borders of both upper and lower lids are strewn with many of them. Careful removal of the scales

3. Sabouraud, R.: Diagnosis and Treatment of Scalp Affections, Paris, Masson & Cie, 1932.

is followed by freedom from them for a few days, only to have them recur as soon as cleanliness is not observed. This condition on the eyelids represents what it represents on the scalp, namely, a simple dandruff.

Once developed, the scaling may persist for years, presenting the same appearance until the patient reaches a ripe old age, or after adult life it not infrequently disappears completely, leaving, however, as evidence of its former presence, a permanent loss of a variable number of cilia. Commonly, however, the scales thicken and become greasy in a varying degree from slight to marked, and then the margins of the lids assume a persistent redness. As itching and irritation are often present, the redness is often increased by rubbing, which likewise causes thickening of the margins of the lids. The scale crusts (combination of dried secretions and exfoliating epithelium) that are now present are more closely glued to the margins of the lids and eyelashes. If these scale

Fig. 2 (case of Zentmayer).—Condition of the lower lids after six roentgen treatments.

crusts are examined microscopically, one will find the pityrosporon and the bacilli as well as many cocci of the Unna type. The pityriasis of dandruff of the margins of the eyelids has now become a real eczema or dermatitis, as evidenced by the redness and thickening of the margins of the eyelids and the scale crusts. It is a full-fledged seborrheic eczema or dermatitis. It is in this stage that the roentgen rays appear to be of value. The progressive loss of many of the cilia is an accompaniment of this inflammatory stage, but partial alopecia may also occur in the earlier noninflammatory stages.

RESULTS OF TREATMENT

In all, fifteen patients were treated. The duration of the condition in the individual case varied from three to twelve or more years. All the patients showed the characteristic redness and a variable degree of thickening of the margins of the eyelids. The actual treatment consisted in weekly exposures of the affected lids to the roentgen rays. Each

patient was given from six to eight treatments, and no chemical agents were applied to the lids during the course of treatment. A favorable influence of the roentgen rays was indicated by more or less thinning out of the infiltrated margins and a decrease in the redness. The subjective symptom, pruritus, present in several cases, usually improved or disappeared.

The method of applying the radiation in this series was as follows: The patient was first placed in a reclining position. Each affected eyelid was treated separately, and generally the lower lid was treated first. The lower lid was pulled down by traction just below the free margin and was held down by the patient's fingers which, during the treatment, were covered by lead foil of sufficient thickness; the patient was told to rotate the eyeball up under the upper lid as far as possible and to keep it fixed in this position persistently during the treatment. Lead foil of sufficient thickness was then placed over the eyebrow and eye far enough down to cover the upper eyelid and the eyeball but not the lower lid. Protection of the eyeball can likewise be obtained by the use of a brass or silver eyeball shield placed on the previously anesthetized cornea and conjunctiva. The roentgen treatment was then given. The roentgen ray constants used in this series were as follows: a 6 inch spark gap, a current of 3 milliamperes, a distance of 12 inches from the focal point to the skin and exposure for sixty seconds. No filter was used. This constituted a 25 per cent dose and was given weekly for from four to six doses. A similar technic was used for the upper lid, but with the eyeball rotated behind the lower lid as far down as possible.

The results obtained in this small group warrant the statement that in the cases indicated the roentgen rays are of distinct benefit and in addition appear to pave the way for the subsequent successful use of the chemical agents. The roentgen rays do not cure the alopecia involving the eyelids, nor do they cure the seborrheal blepharitis. When chemical agents fail to give relief, a physical agent such as the roentgen rays is worthy of trial. When properly used, this agent is harmless for the conjunctiva or the eye itself. The roentgen rays are of unquestionable value in the chronic, red, thickened forms of seborrheal blepharitis, but only as an additional aid to the generally recognized beneficial measures.

In some, as in two cases followed up for several years, the improvement was apparently permanent, but in most cases it was temporary.

Most of the patients used in this study were obtained through the cooperation of Dr. William Zentmayer, who aided in the preparation of this article.

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DISCUSSION

DR. WILLIAM ZENTMAYER: I am sure that we are all indebted to Dr. Greenbaum for having presented his paper before this section rather than before a society on dermatology, because it is of value to have the dermatologist's point of view on this condition.

In most of the textbooks the subject is treated in a sketchy and perfunctory way, in marked contrast to the excellent clinical description that Dr. Greenbaum has given us.

His choice of the term "dandruff" is particularly descriptive, though the one that was in use in the Norris Clinic, and probably in other clinics, "scaly blepharitis," also conveyed the characteristic of this form of blepharitis.

Dr. Greenbaum is in accord with Dr. Sanford Gifford, who thinks that roentgen therapy is especially useful in blepharitis of the more severe type which is refractory to the usual methods. He uses a technic suggested by Borghoff of Omaha. With the rest of the lids protected by lead foil, the borders of the lids are exposed to a current of 3 milliamperes, with a 6 inch spark gap, at a distance of 8 inches, for from forty seconds to one minute. This exposure is repeated weekly for three treatments. The lashes are never lost. Two or three roentgen treatments will usually relieve a condition of years' standing.

Dr. Greenbaum is to be commended for his conservative estimation of the results he obtained.

The ophthalmologist desires to be assured that in this treatment there is no danger to the transparency of the lens, though one would take this for granted.

DR. G. E. DE SCHWEINITZ: Doubtless all of us have been disappointed in the results obtained in the treatment of various forms of blepharitis which persist in spite of the utilization of well recognized therapeutic measures, including the correction of refractive errors, and we are indebted to Dr. Greenbaum for calling our attention to the use of roentgen rays in the management of this troublesome disease, especially that variety which is known as chronic seborrheal blepharitis.

Several years ago, disturbed by my failure to achieve satisfactory results, and as the problem was one which was dermatologic rather than ophthalmologic, I appealed to Dr. John H. Stokes, professor of dermatology and syphilology at the University of Pennsylvania, for assistance, and the results were so excellent, especially in the case of one patient whose inflamed lids failed to yield to the usual methods of treatment, that I asked him to send me an exact record of his technic. This he has done, and I quote from his letter as follows:

"The process, dermatologically speaking, may be seborrheic in character and associated with a seborrheic dermatitis of the scalp, and it may be allergic, due to various contact irritants, including preparations used for the treatment of the scalp, eyebrows and eyelashes and the conjunctival sac itself and for the dyeing or dressing of the hair. Regardless of the source of the dermatitis, these patients tend to improve under roentgen ray therapy, though the permanence of the result depends on the detection and correction of the exciting and, in some cases, the predisposing causes. The type of irradiation which I employ is unfiltered roentgen rays, using a low milliamperage and a 6 inch spark gap, with doses of from one-eighth to one-fourth skin unit once weekly for from three to eight exposures. A good deal of judgment must be exercised in the treatment of the collateral condition such as seborrheic dermatitis of the scalp with the roentgen rays, and the amount of protection required for eyebrows, etc., can be determined only by experience. In general, blondes tolerate less irradiation than brunettes, and the dry types of skin much less than the oily types. When the process can be recognized as definitely

seborrheic, I restrict the patient's carbohydrate intake. When there is a definite allergic factor, but when it is difficult to pin the condition down to a specific exciting cause, a certain amount of general desensitizing effect may be secured by autohemotherapy, general ultraviolet irradiation and the administration of large doses of calcium, etc. There is, too, a type of blepharitis which has a neurogenous factor in the background, and this must be dealt with by a reeducation of the patient in his reaction toward his life and environment. I think that it ought to be generally understood that the irradiation therapy, while very effective, is not productive of a permanent result unless the constitutional background has had proper attention coincidentally."

He added: "The x-ray equipment used in this sort of unfiltered work should be standardized physiologically against the blonde skin by the method described by MacKee and Remer. I have never been willing to trust this type of treatment to machinery run purely by electrical constants, and I have never attempted to translate the dosage into the 'R' system."

NEWER FORMS OF BIFOCALS

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In several previously published articles [1] comparisons were made between the properties of the ordinary standard lens forms and those of various widely advertised and exploited copyrighted or patented lenses. In these papers it was always my purpose to show how the ophthalmologist could combat the commercial domination of ophthalmic lens forms by designating in every prescription the exact coflexure, type, style and color of the glasses, matters that are nearly as important to the comfort of the patient as the dioptric power, and an essential part of the prescription. It is obvious that it is not to the best interest of those concerned to allow the patient and the optician to decide which is the best form, color or style in which the lenses should be ground. The trained optician will adjust the poles of the lenses to the visual lines of the eyes, place them at the proper distance and with the best angle, choose the size and shape—even the size and shape of the segments in bifocals—for each patient's individual peculiarities. But the dioptric power, coflexure, type of bifocal and color of glass must be written in the prescription and stated in standard, nonproprietary terms that can be understood and carried out in any well equipped optical shop.

Heretofore, the discussion concerned the coflexure of lenses in general. I shall now consider a few of the requirements for a good bifocal, with particular attention to the stressed points of superiority of several advertised forms.

The two types of bifocals most widely used at the present time are the fused and the one-piece, which are known by a variety of trade names. Each has certain faults; neither has the possibilities, optically, of the two-piece (split and perfection) bifocal; but they can be made to meet the practical requirements of good bifocals, and, since they are better looking than either the two piece or the cement, they are now nearly universally used. Both of these types have been called invisible, particularly the fused, but one knows that this is not true. The segment in the ordinary fused bifocal is somewhat less visible than that in the

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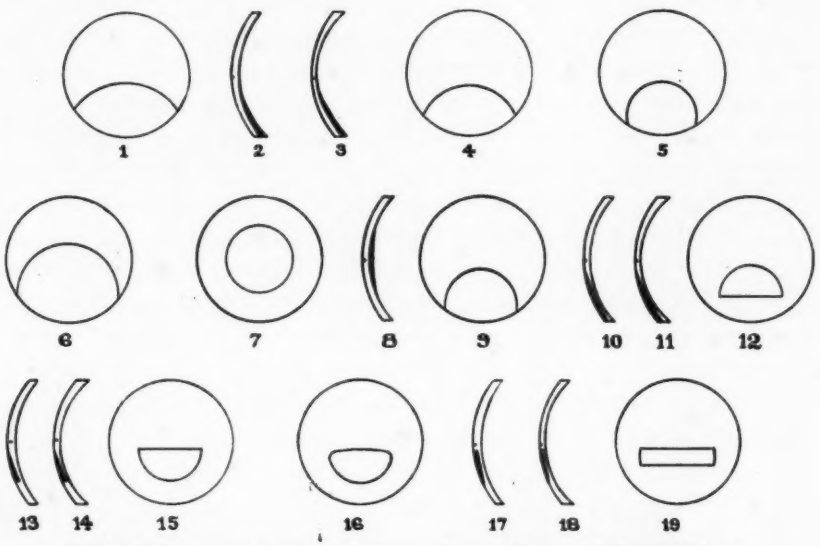
1. Cowan, Alfred: Point-Focal Lenses, Guildcraft **1**:19 (Sept.) 1928; The Newer Forms of Ophthalmic Lenses, Arch. Ophth. **2**:322 (Sept.) 1929; Glasses: How Should the Ophthalmologist Write His Prescription? ibid. **5**:849 (June) 1931.

one-piece type; but none is truly invisible, whether the segment has a knife edge or a feather edge. In the fused types, *12, 15, 16* and *19* in the accompanying figure, the thickened, cut portion—the chord of the segment—lies within the lens. This is shown in sections *13, 14, 17* and *18*. These types of segments are always more visible than any of the others, fused or one-piece, despite the claims of the patentees. Although the annoyance might be negligible, this thickened edge introduces a mirror surface which must cause some reflection, whether the cut is curved or straight, and even though it is *angled along the line of sight*, whatever that means.



Several shapes and cross-sections of one-piece and fused bifocals.

Objections have been made to the fused type of bifocal in that the fusing causes a slight flowing and mixing of the two glasses, resulting in a hazy zone between the distant lens and the segment. Another fault is a fringe of colors seen at the prismatic edge of the segment, which is exaggerated because the highly dispersive flint glass of the convex segment is placed exactly opposite the arrangement necessary for the elimination of chromatic aberration in a lens. Much ado has been made about these defects, even though there have been comparatively few complaints. However, by improved methods of manufacture and by using glass of very nearly the same dispersive power for both upper and lower portions, both faults have been eliminated to a great extent in the latest types of fused bifocals. While the production of glass of a high refractive index and a low dispersion is an achievement, it is inaccurate to state that these bifocals are entirely free from color—

there is always some dispersion, depending on the degree of the prism at the edge of the segment.

In the one-piece bifocal in which two different curves are ground on one surface, the reading portion must be the whole or a segment of a circle containing an unbroken arc (figs. *1, 4, 5, 6* and *7*). If the circle is complete, it may be placed anywhere in the upper lens; if incomplete, the chord must coincide somewhere along the edge of the lens. In this type of bifocal the segment is placed on the inside, concave surface, although it can be specially ground on the front, but always on the noncylindric side of a toric lens. These lenses may be obtained with plano, —4, —6, —8 or —10 diopter back surfaces. By special order the segment can be ground on a +4 or a +6 convex surface on equal-sided or nearly equal-sided cataract glasses. The reading portion can be ground to a specified size and centered as desired.

In the fused type of bifocal the segment can be made in various shaped sections of a circle, as shown in *9, 12, 15, 16* and *19* of the figure, and in different sizes, and may be placed, as in *12, 15, 16* or *19*, so that the patient can look underneath through the distant portion. In this, as in the one-piece bifocal, the segment is always placed in the noncylindric side, preferably the convex, because of the optical principles involved. The ordinary toric fused bifocals, therefore, have cylinders ground in the inside concave surface; but several widely advertised "best form" fused bifocals, in which the cylinder is ground in the front, have the segments set in the concave spherical surface. The segments are made in various sizes and shapes and can be centered as desired.

It is one of the faults of bifocal lenses that the vista for both far and near is more or less restricted. Therefore, the shape of the segment, as well as its size, height and location, must be carefully chosen to suit the requirements or habits of the user—whether for all-round general use or for strictly vocational purposes. It may not be said that any one type gives the fullest width of reading vision where it is most needed for all purposes and for every wearer. One person may prefer a small segment for all purposes, another a larger one; a shape that suits one may not suit another; one may find it a great advantage to have the segment placed so that he can see through the distant lens below, while another may find this annoying.

In every lens there is a prismatic effect at any point except at the principal axis or pole. This increases in proportion to the power of the lens and the distance from the pole. In convex lenses the effect of a prism with its base toward the center causes an apparent displacement of objects toward the edge and with greater degree as the edge is approached. In concave lenses the reverse is true. In a bifocal it is

necessary to consider not only the prisms of the distant lens and the reading portion, but also the residual prism by the combination of the two. The residual prism at a chosen point depends, of course, on the distance from the pole of each lens in the bifocal at this point. This can be seen in the cross-section diagrams, in which the reading addition is represented by the solid portion and the pole of the distant lens by the dot.

Consider *2* in the figure, which represents a section through a convex one-piece bifocal. Here the prism base up in the lower part of the distant lens is somewhat neutralized by the prism base down in the reading addition. In the concave lens, *3*, the prismatic effect of the distant lens is increased. The same is shown for the fused bifocals, *10* and *11*. In the one-piece bifocal (*7* and *8*), in which the entire reading portion is in the center, the poles of the upper and lower lenses coincide, but there is a prismatic effect all around the inner, stronger lens.

These prismatic effects are modified somewhat in such types of fused bifocals as shown in *12*, *15*, *16* and *19*, in which the cut portion of the segment is placed inside the distant glass. The shape of the segment in *12* allows the patient to use the distant lens underneath the segment. It does not decrease the prism at the upper edge of the segment, and in the concave lenses it adds to the prism of the distant lens at the lower portion of the segment. It makes a poor concave bifocal. In the shape shown in *15* and its modification, *16*, in which the patient is allowed to use the lower portion of the distant lens, the prism is lessened at the top of the segment, but increased at the bottom, especially in the higher convex powers, and in the very high powers it is increased also near the upper part. It makes a poor bifocal for the higher convex powers. In the concave lenses it is an improvement. In the style shown in *19*, the prism is reduced at both the upper and the lower edges of the segment, but remains on each side and offers a narrow reading portion. For the reasons stated, it is more conspicuous than any of the others.

After all has been said, the prismatic effects of a pair of bifocals of nearly the same power need seldom be considered. When the refractive error is nearly equal in both eyes, the prismatic effects in different portions of the lenses are symmetrical—prisms, bases up, down or out and in. In certain cases of anisometropia and in high astigmatism with widely different principal meridians in the two eyes, however, a correction must be made for the prismatic difference. It is not the purpose of this paper to go into the matter.

The patient can see the dividing line in any form of bifocal, and when the eye is directed through this line there must be doubling. It should therefore be placed where it will cause the least annoyance. The

prismatic displacement which takes place at the edge of the segment, where the prism is greatest, causes what is called a gap or a jump of the image.

There has been entirely too much ballyhoo in regard to the jump in bifocals, considering that in most cases it is hardly noticed after a few days. There is no bifocal made in which there is no jump. It may be taken out at the top of the segment and placed at the bottom, as has been done in one well known bifocal and advertised as a great improvement. The advertisers in their displays illustrate the small amount of displacement at the upper edge of the segment, but they forget to show the apparent displacement (increased by the prismatic effect of a convex distant glass) at the lower edge, the place through which the wearer must look to see the curb or steps. A jump here may be most annoying and even dangerous at times. As a matter of fact, neither the jump nor the gap is of such great importance. Patients usually learn to ignore it in a few days. There cannot possibly be two distinct images—either one or the other is indistinct, depending on the distance at which the object is viewed, and it is the indistinctness through the wrong part of the glass that is most bothersome to inexperienced wearers of bifocals.

It may be well to repeat what has been said in the previous articles concerning the so-called corrected lenses—point focal lenses which are made to eliminate or minimize the astigmatism of oblique pencils. It is true that for a lens of given power and thickness, set at a certain distance from an eye of known dimensions and within a given distance of the object, the astigmatism of oblique pencils can be almost entirely eliminated within a solid angle of 60 degrees by a certain coflexure or combination of back-front surfaces; but no lens of a single piece of glass can possibly be shaped to eliminate the astigmatism of oblique pencils in all meridians unless it is spherical on both sides and placed at a fixed distance before an eye of known dimensions and for a constant object distance. Even then the lens is not corrected for any other aberration. A compromise may be made, but no lens of this kind can be made to eliminate entirely, to the very edge, both the error of marginal focal power and the astigmatism of oblique pencils at the same time. For the same person, the lens designed for distant vision must have an entirely different coflexure from the lens designed for the reading distance. In a spherocylindric bifocal there are four powers and two distances to be computed, only one of which can be corrected. In spite of these well known facts, exploiters of certain bifocals claim their lenses to be corrected to the very edge for both far and near. There are no bifocals made which are accurate to the very edge; but such lenses are not even necessary for practical purposes, and, in the ordinary powers, the —6

back one-piece bifocal for the hyperope and the fused +6 spherical base for the myope answer the requirements of good lens forms.

The most carefully chosen and adjusted bifocals are still a makeshift for two pairs of lenses; there are no perfect bifocals. However, the convenience with which the presbyope is enabled to see far and near with one pair of glasses overbalances the faults and disadvantages inherent in any type of bifocal. These faults and the annoyances which are likely to occur must be carefully explained to the patient, especially when bifocals are worn for the first time; and, in order to choose the best for each patient, the various types with the particular optical principles and the practical advantages and disadvantages of each must be compared one with the other.

Ophthalmologists owe much, of course, to the enterprise of the research departments of large optical manufacturers, who are entitled to every credit for their accomplishments and innovations in the field of ophthalmic science. The sincere manufacturer who explains his findings in a scientific manner and with some respect for one's real or supposed intelligence, should and does have the full support and cooperation of ophthalmologists; but ophthalmologists must not justify a certain contempt for knowledge of ophthalmic optics that some firms manifest by the many exaggerated and even absurd claims which are made for their widely advertised products. It has been emphasized in the papers mentioned that the ophthalmologist owes it as a duty to himself and to his patient to be familiar with the basic optical principles of ophthalmic lenses. Only then can he understand and appreciate the advantages of lens forms and choose the best for each patient.

ORBITAL LYMPHOMA IN CHRONIC LYMPHATIC LEUKEMIA

REPORT OF A CASE

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The occurrence in cases of lymphatic leukemia of lymphatic lesions in the orbit apparently unrelated to the lid, conjunctiva or lacrimal gland has rarely been reported. Since the pathologic and clinical characteristics of certain orbital inflammations, lymphomas and neoplasms are still obscure, they are frequently difficult to classify. Therefore, reports of these conditions should be instructive, and the following case is considered worthy of presentation.

REPORT OF CASE

S. S., a man, 65 years of age, was first examined at the Manhattan Eye, Ear and Throat Hospital on Oct. 10, 1928. He complained of drooping of the right lid and lacrimation. His daughter stated that beginning five months previously she had noticed a gradual protrusion of the right eye. There was no history of trauma.

Examination of this eye showed that vision with correction was 20/30. The results of functional tests and of external examination of the eye were normal. Except for slight fulness of the retinal veins the fundus was normal. There was edema of both lids, that of the lower lid being unusually pronounced, and slight ptosis was noted. There was exophthalmos of 3 mm. The eyeball was dislocated downward and outward and limited in upward rotation by the pressure of an orbital growth which produced paresis of the superior rectus muscle, causing diplopia. The ocular conjunctiva was moderately chemotic, mainly around the limbus. The scleral conjunctiva had an icteric appearance. Palpation of the lid below the supra-orbital ridge disclosed a definite flat, firm mass in the depth of the orbit between the globe and the orbital roof. The mass was about the size of a lima bean and was not attached to the skin, periosteum, conjunctiva or lacrimal gland but was freely movable in all directions. The periosteum of the orbit was not tender or thickened. On palpation of the globe toward the apex of the orbital wall, no resistance was encountered. No bruit was audible. The left eye was normal.

Following the examination of the eyes, various diagnoses were considered in the order of their probability, as follows: syphilis, a benign or malignant growth, a leukemic nodule and nonspecific inflammation due to a local or a general cause. The patient was referred to the hospital for a physical examination, the results of which follow:

The patient was a Jewish man, born in Russia, 65 years old. He was married and had five living children; one child died of acute anterior poliomyelitis. There

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was no history of syphilis, tuberculosis or any other acute or chronic infection. He always enjoyed excellent health, with no major illnesses until the onset of the present ocular condition five years prior to examination. He drank whisky moderately and smoked ten cigarets daily. He had a sallow appearance and was asthenic, but his skin and weight were normal. He was a carpenter and had always worked at his trade until five years previously, when the ocular disturbance forced him to discontinue it. The condition of the eyes was as previously reported. All the teeth had been extracted several years previously. The pharynx was chronically injected. The nares were normal, except for a deviation of the septum. On an attempt to palpate the lymphatic glands, only one small gland in the right axilla was felt. The chest was normal except possibly for posterior râles. The blood pressure was 140 systolic and 80 diastolic. There was no abdominal distention or tenderness. Neither the liver nor the spleen was palpable, nor could any masses be felt. There was no edema of the extremities. Neurologic examination disclosed nothing abnormal. The temperature and the respiration were normal during the ten days in the hospital.

The results of the laboratory examination, performed by Dr. Eggston, were as follows: The urine and the blood chemistry were normal. The Wassermann test of the blood was negative; the Kahn test, slightly positive. The blood count showed: erythrocytes, 4,640,000; leukocytes, 17,000; polymorphonuclears, 33 per cent; small lymphocytes, 24 per cent; large lymphocytes, 17 per cent; eosinophils, 3 per cent, and transitional cells, 21 per cent. The hemoglobin was 95 per cent.

Roentgen examination, performed by Dr. Law, showed: involvement of the right frontal sinus; a small mass the size of a lima bean in the orbit, apparently consisting of fibrous tissue; marked infiltration of the maxillary antrums, especially the right.

In view of this preliminary report, it was decided, on account of the possibility of syphilitic infection, to give the patient energetic antisyphilitic treatment with inunctions, potassium iodide and later arsenic, the last mentioned drug having an influence on the lymphatic tissue. After six months' treatment there was a definite diminution of the orbital mass and of the exophthalmos.

The patient continued to visit the clinic intermittently for a year, during which time the Wassermann and Kahn tests were reported negative. In April, 1931, the orbital mass appeared larger, the exophthalmos had reached 6 mm. and ocular chemosis was marked. At that time examination of the blood showed: red cells, 4,650,000; white cells, 22,000; polymorphonuclears, 27 per cent; large and small lymphocytes, 73 per cent; eosinophils, 3 per cent; Wassermann and Kahn tests, negative.

For a short period increasingly large doses of potassium iodide were given, and general hygienic measures were also taken. The ocular condition, however, did not improve, becoming gradually more aggravated in every respect until the danger of corneal involvement was imminent owing to the marked exophthalmos. Removal of the orbital growth was therefore advised, and the patient gave his consent on Nov. 1, 1931.

Local anesthesia was used, procaine hydrochloride being injected in the supraorbital region, including the lids. An incision was made in the skin along the entire eyebrow, the periosteum was exposed and the septum orbitale was incised. The deeper orbital tissues were separated by dissection with a blunt instrument, exposing a flat mass, which was dissected from its surrounding tissue. It was ovoid, flat and firm and about 12 by 9 mm.; it was not attached to the bone, conjunctiva or lacrimal gland. The wound was closed with silk sutures.

The patient remained in the hospital for ten days. When discharged, he showed improved motility of the eyeball except that movement upward was still limited owing to the involvement of the superior rectus muscle. The exophthalmos had slightly receded, and the chemosis had decreased.

The removed growth was sent to the laboratory for examination. The pathologic tissue is shown under high and low power magnification in figures 2 and 3. It consists mainly of an abundance of packed lymphocytes surrounded by an indefinite capsule. Areas of fibrosis can be seen. Other elements include several plasma

Fig. 1.—The patient after operation.

cells, a few eosinophils, endothelial proliferation and many monocytes. Mitotic figures are seen in a few of the lymphocytes. The walls of the vessels are thickened as a result of hyalinization. No follicles are present. Various opinions were expressed with regard to this growth. Dr. Ewing made a diagnosis of a leukemic growth on the basis of the appearance of the specimen and the report of lymphatic leukemia. Dr. Eggston considered the condition chronic lymphadenopathy.

Following the removal of the orbital growth, only local treatment of the eyes was administered. The condition of the eyes improved slightly for five months, at the end of which time edema similar to that in the right lower lid gradually appeared in the left lower lid and increased slowly, without any other change. The patient became very ill, requiring medical attention, and on May 31, 1932, was

Fig. 2.—Section of the orbital lymphoma under low power magnification.

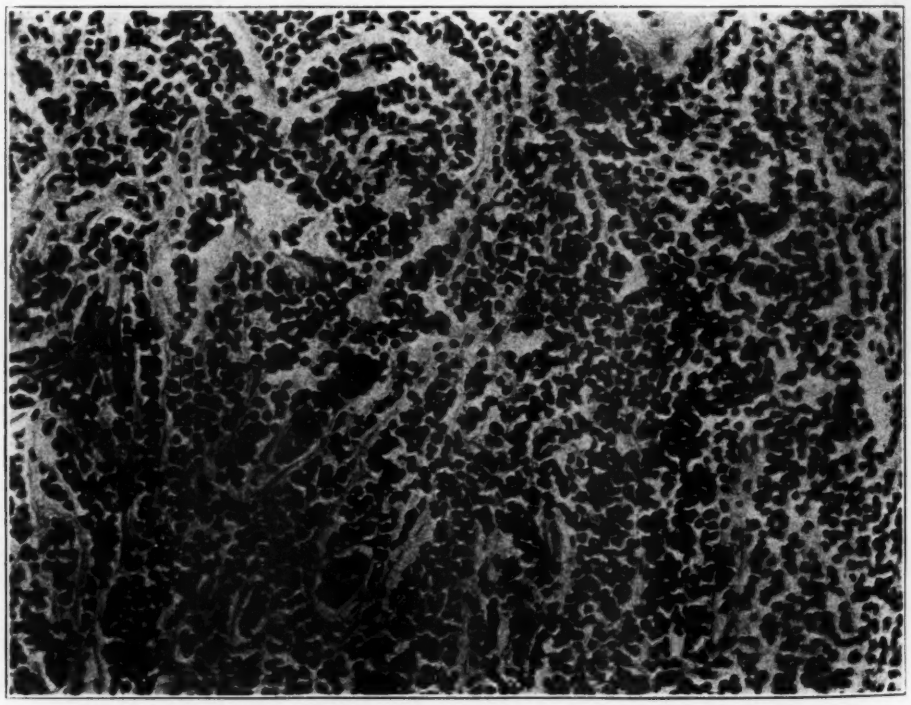

Fig. 3.—The same section as in figure 2 under high power magnification, showing: predominance of lymphocytes; an area of fibrosis; a few plasma cells; a few eosinophils; monocytes; mitotic figures in a few of the lymphocytes, and hyalinization of the vascular walls.

referred to the medical ward of the New York Post-Graduate Medical School and Hospital, where general physical and laboratory examinations were conducted. The results of the physical examination were practically the same as those previously noted. The laboratory reported as negative the Wassermann and Kahn tests of

Fig. 4.—A section of an inguinal gland under low power magnification.

the blood and also the Wassermann and colloidal tests of the spinal fluid. The urine was normal, as was the blood chemistry except for a slightly increased icteric index. Dental examination gave negative results.

The report from the pathologic laboratory (Dr. Whitcher) was as follows: red blood cells, 4,930,000; white blood cells, 24,350; polymorphonuclears, 13 per cent; lymphocytes, 85 per cent; polymorphonuclear neutrophils, 13 per cent; mono-

cytes, 2 per cent; small lymphocytes, 2 per cent; large lymphocytes, 83 per cent; no abnormal leukocytes; hemoglobin, 98 per cent, and color index, 1. The basal metabolism was normal

The results of roentgen examination, performed by Dr. William H. Meyer, were as follows: There was marked membranous infiltration of the maxillary antrums and of the ethmoid cells, especially on the right. Examination of the chest and abdomen showed enlargement of the heart of the aortic type; senile changes and moderate fibrosis; thickening at the roots of the lungs, with secondary chronic

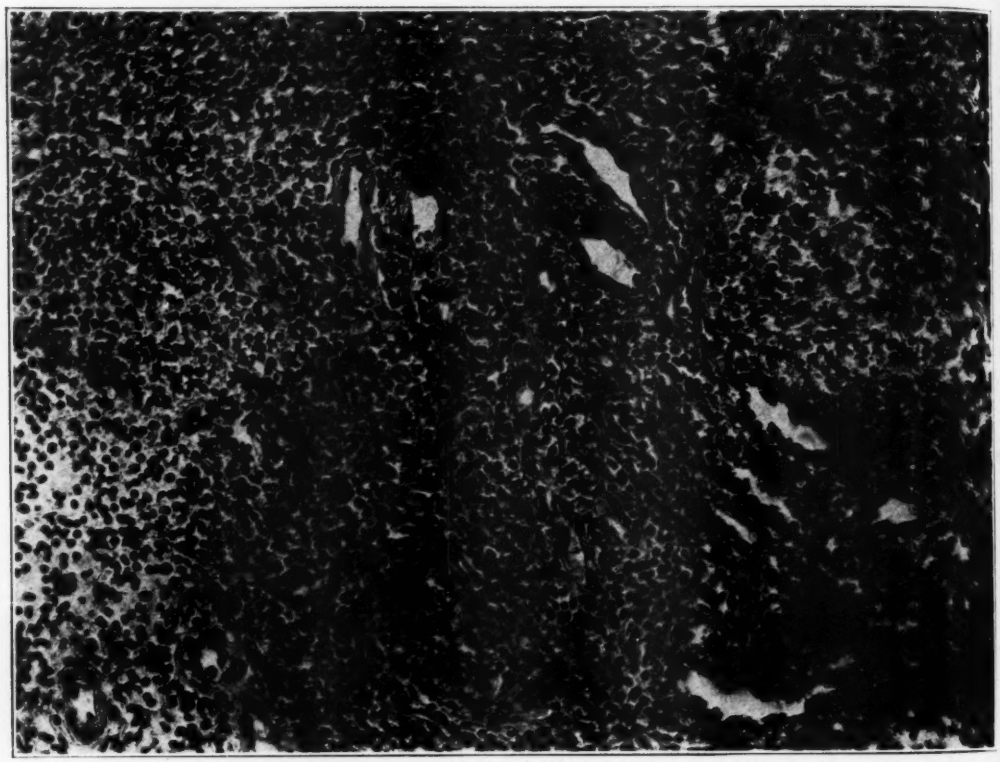

Fig. 5.—The same section as in figure 4 under high power magnification, showing: predominance of lymphocytes; fibrosis; endothelial proliferation; normal lymph sinuses, and lymphocytic infiltration.

central bronchial thickening; excessive elevation of the left side of the diaphragm, and possible splenic enlargement.

While in the hospital the patient received local treatment of the eyes together with general care and rest, and his physical condition improved. He was discharged after ten days and returned occasionally to the clinic at the Manhattan Eye and Ear Hospital.

The right eye, which was the first involved, was now much less proptosed; the ocular conjunctiva was slightly congested; the motility of the eyeball upward was markedly improved; vision and the reactions to functional tests were unaltered, and the fundus was normal. There was no recurrence of growth in the orbit. The swelling of the lids in both eyes was slightly reduced.

Although the general and the ocular condition slowly improved, the axillary as well as the submaxillary and inguinal glands became palpable. On Dec. 3, 1932, examination of the glandular structures showed the inguinal glands to be markedly enlarged. It was believed that histologic examination of one of these glands might be valuable in further establishing the diagnosis of the orbital tumor. Photomicrographs were made under the same magnifications that were employed in the case of the orbital growth (figs. 4 and 5), and the similarity of structure of the two tissues can be readily recognized. The inguinal gland shows a surrounding capsule of fibrous tissue. The node consists predominantly of lymphocytes intermingled with fibrous tissue. Endothelial proliferation is present. The numerous lymph sinuses appear normal, and no follicle formation is apparent as in the removed orbital growth. Lymphocytic infiltration is a prominent feature. Dr. Ewing expressed the opinion that the removed inguinal node was pathologically similar to the orbital growth.

Neither radium nor roentgen radiation had previously been employed, owing to the temporary improvement under antisyphilitic treatment and also because the diagnosis of lymphatic leukemia could not be definitely established. It was decided by Dr. Robinson, however, that the application of radium tubes was the best method of treatment. This has been carried out for a year, applications being made to the axillae and temples at first once a week and later every two or four weeks. The results with regard to the general and the ocular condition have been satisfactory, but it is too early to judge of the final results. If treatment with radium becomes unsatisfactory, roentgen irradiation will be tried.

Recently a soft lobulated mass the size of a small bean and apparently not attached to the lacrimal gland developed in the outer part of the conjunctival fornix of the right eye. The result of radium treatment of this node has been encouraging.

Two months ago the patient consulted Dr. Ottenberg. His report of the findings in the blood was similar to the previous reports. He believed the underlying disease to be chronic lymphatic leukemia.

The prognosis of the ocular condition depends entirely on the severity of the lymphatic leukemia and on its response to irradiation.

COMMENT

It is claimed by anatomists and ophthalmologists that the orbit contains neither lymphatic glands nor lymphatic vessels. However, Birch-Hirschfeld proved experimentally the existence of orbital lymphatic spaces with endothelial linings in animals, and he and other authorities on orbital diseases believe that lymphatic spaces probably exist in the human orbit as they do in other parts of the body. It is also known that in leukemic diseases lymphocytic infiltrations appear in the choroid and retina, where lymphatics are supposed to be lacking.

Is it not possible, therefore, that from lymphatic spaces around the adipose tissue or from perivascular lymphatic spaces a leukemic nodule may originate in the orbit as a result of the abnormal state of the blood, thereby explaining one factor in the causation of orbital lymphomatoses?

According to Hocheim's classification, four types of lymphoma may occur in the orbit. Included in this group is an orbital leukemic growth of which the tumor in my case is an example.

The inflammatory reaction observed in the orbital growth in the case reported was probably a secondary reaction in the growth itself, and the case cannot be regarded as one of nonspecific inflammation producing a granuloma or an inflammatory pseudotumor.

The structure of the leukemic orbital growth showed no evidence of malignancy, and no recurrence or metastasis is present after five years. The general adenopathy is a part of the leukemic disease and not metastatic.

The occurrence of marked edema of the lower lid of the left eye five months after the removal of the orbital growth on the opposite side, as well as the general adenopathy and the blood picture, indicates a general dyscrasia.

The fact that the pathologic structure of the removed inguinal gland was similar to that of the orbital growth suggests a common etiology, namely, leukemia.

The clinical aspect of the case, especially the blood picture (indicative of a persistent moderate lymphocytosis), together with the pathologic changes and the five year duration of the disease, leads to the tentative conclusion that the orbital growth is a lymphoma or a leukemic growth accompanying chronic lymphatic leukemia.

Finally, a study of the literature relating to these and to allied conditions reveals various interpretations [1] with respect to the classification of orbital lymphomatoses as well as to their rare occurrence. Further studies and reports on the experimental anatomy of the orbital and ocular lymphatics are therefore desirable, as well as a more definite knowledge of the relation of the various forms of leukemia to orbital and ocular lesions.

DISCUSSION

DR. PERCY FRIDENBERG: Was any tissue removed from the orbit except the lymphoma? If so, was the tissue examined and did it show any changes? The very slow course of this condition, the fact that improvement was only partial after removal of the tumor, the persistence of the exophthalmos and the limitation of motion suggest that there may have been a diffuse lymphomatosis of the orbit.

DR. MARTIN COHEN: No tissue was removed from the orbit except the mass, but the rest of the tissue looked absolutely normal.

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SIDEROSIS BULBI (XENOGENOUS)

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To the internist and the pathologist siderosis means the deposition of pigment from the blood in various organs of the body, such as the spleen, liver, lungs, bone marrow and lymph nodes. Of course, the presence of free iron in any large amount in the blood stream would result in the deposit of this iron in the aforementioned organs also, as Migay and Petroff showed when they injected iron and also carmine blue into the blood streams of dogs. The spleen and liver contain the greatest amounts of iron. It is not present in the tissue cells of these organs, but is held in the reticulo-endothelial cells, which are specially differentiated phagocytic cells. The lymph nodes and the bone marrow contain a moderate amount of the foreign particulate material in these reticulo-endothelial cells, but the lungs contain much more, and the spleen and liver the most; there is none in the kidney.

For the ophthalmologist, however, siderosis has an entirely different significance and prognosis. It is an extremely grave ocular condition fraught with danger to the patient, for, as Leber said, oxidizable metals, such as iron, steel and copper, may result in a contraction of the vitreous and in detachment and atrophy of the retina. In siderosis bulbi, the reticulo-endothelial cells, which play so important a part in general siderosis, are conspicuous by their absence. The movement of the iron particles takes place in the globe proper without the help of these phagocytes, but shows the marked predilection of the iron for the epithelial cells in the globe and those tissues in the globe derived from epithelial cells.

Free iron which may be present in the blood stream is removed by the reticulo-endothelial cells from the vascular system and deposited in the liver, spleen and other organs. However, free iron which may be present in the eye as an intra-ocular foreign body (xenogenous) or iron which is derived from intra-ocular hemorrhage (hematogenous) combines with the cytoplasm of the epithelial cells of the globe, the nucleus of the cell being entirely free from any pigment; thus the iron becomes insoluble only to be made soluble again by the oxidizing fluids of the tissues, and so is removed from the eye through the lymphatics. This accounts for the large amount of iron found in the lymphatics around the retinal vessels but not in the retinal vessels proper. Leukocytes play a small part in taking up the iron pigment (von Hippel).

From the laboratories of the Manhattan Eye, Ear and Throat Hospital.

The reticulo-endothelial system of cells has its derivation in the mesoderm, and this is also true of the lymphatics which surround the retinal blood vessels. It is here, in these lymphatics, that the reticulo-endothelial cells which remove the pigment from the eye with siderosis have their origin. The union of the pigment with the epithelial cells of the globe is peculiar as the epithelial cells are derived from ectoderm, whereas the phagocytic cells which remove the iron pigment are derived from mesoderm. However, this is important, because the pigment in the ectodermal cells can be oxidized and thus can leave these cells so that their function is unimpaired. Once the pigment is taken up by the histiocytes, however, no oxidation can occur while the pigment remains firmly united with the cytoplasm of these cells, which are finally deposited in the spleen, liver and other organs in which the pigment is to be found in the reticulo-endothelial cells only. Of course, the epithelial cells of the eye which are impregnated with iron do not always resume their normal functions; this fortunate result depends on the amount of iron and the duration of its stay in the cell, so that a long-standing siderosis of marked degree does not of necessity clear up entirely or even partially just because the foreign body has been successfully removed.

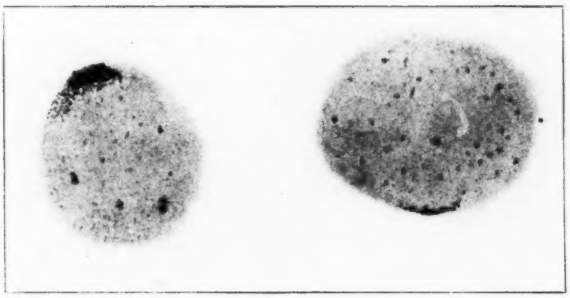
However, the life cycle of these histiocytes is short, and when they disintegrate the iron is taken up by new and younger histiocytes which in turn break up and yield their iron either for metabolism and use by the blood-forming organs or to be taken up again by young reticulo-endothelial cells. In the brain, however, where iron pigment at times is present as the result of hemorrhage, Helfand showed that the iron which is given up by disintegrated histiocytes may remain in a clump enmeshed in the remnants of its phagocytic cells and resisting any attempts at further phagocytosis. The illustration shows on the left one of these histiocytes with iron particles in both the cytoplasm and nucleus; to the right is a cell the nucleus of which is almost entirely destroyed, the pigment clumps remaining in situ.

PATHOLOGY

In the eye one encounters an entirely different and unique phenomenon of the ingestion of iron by cells; epithelial cells of ectodermal origin take up the iron, become swollen with the foreign material, lose their function to a marked degree and then, when the original source of the iron is removed, are able to give up their iron content completely and resume their normal functions. In no other organ of the body is this seen; all other organs call on the reticulo-endothelial system of mesodermal origin for help, and the histiocytes themselves are so overcome by the foreign material they ingest as to result in their own destruction, necessitating a call on new and younger cells to continue their work.

This predilection of the oxidized iron particles for cells of ectodermal origin can be utilized, I believe, for vital staining when one wishes to differentiate between malignant cells of ectodermal and mesodermal origin. The origin of sarcoma or carcinoma of the choroid is a moot point, as is indicated by the discussion as to the proper name for these malignant growths. In a subsequent communication, I shall report on some experiments which attempt to determine this point.

Some experiments on siderosis bulbi carried out by Mayou on albino rabbits are highly instructive in that the epithelial cells are seen to retain the iron, show marked changes and suffer a great deal, the iron being in a colloidal form. The experimental procedures were as follows: First, a fragment of iron was put into the anterior chamber with no injury to the lens or adjacent structures. Three months later it was seen that the iron was still at the bottom of the anterior chamber where it had originally sunk, and the eye appeared quiet. Microscopic



On the left is a histiocyte with iron particles in the cytoplasm and nucleus; to the right is a cell the nucleus of which is almost entirely destroyed, the pigment clumps remaining in situ. (After Helfand.)

examination revealed that the iron, which was in a colloidal state, was present in the sphincter and dilator muscles of the iris. The second experiment involved the placing of the metal in the middle of the lens, and after nine weeks brown deposits were seen in the capsule of the lens. Microscopic examination showed the epithelium of the anterior capsule stained with ferrocyanide, while the rest of the eye was normal. In the third animal, the iron was placed in the vitreous, and on microscopic investigation eleven and a half weeks later it was seen that the iron had been taken up by the retina, the pigmented epithelial cells of the retina, the cells of the ora serrata, the back of the iris and the sphincter muscle of the iris. The fourth procedure consisted of putting the iron into the vitreous and one week later opening the anterior capsule of the lens with a discission needle. Microscopic examination eleven and a half weeks later showed the presence of iron in the sphincter and dilator muscles of the iris, the capsular epithelium

of the lens, the epithelium of the ciliary body, the inner layers of the retina and the cells on the membrane of Bruch of the choroid.

The changes due to siderosis bulbi, then, can be summed up as follows: In the conjunctiva and cornea the epithelium is stained only when the iron protrudes into the conjunctival sac, thus exposing the cornea and conjunctiva to direct contact with the foreign body. The iris contains iron in its superficial layers and in the sphincter and dilator muscles because these are of epithelial origin and have an affinity for iron; this, together with the chronic iritis which is set up, results in a dilated pupil, as demonstrated by Verhoeff, who disagreed with Tuckett in his belief that the dilatation of the pupil is due to involvement of the third and sympathetic nerves supplying the muscles of the iris, although Verhoeff conceded that the nerve endings in the muscles might be affected. As regards the lens, an important factor must be taken into consideration, and that is that the capsule of the lens must be damaged to allow the colloidal iron to enter the lens where it is taken up by the epithelium of the anterior capsule and is seen with the slit lamp as fine brown deposits. The rupture of the capsule may take place anteriorly or posteriorly, and the latter may occur by concussion without giving rise to any clinically visible opacity of the lens. If the foreign body is in the lens, then the fibers of the lens may become impregnated. In the ciliary body the two epithelial layers, both the pigmented and the nonpigmented, are impregnated with granules of iron, resulting in a destruction of both of these layers with the subsequent formation of a more albuminous fluid for circulation through the anterior chamber. The result is glaucoma, a fairly frequent termination in cases of siderosis, even though the angle of the anterior chamber remains open. In the retina the rods and cones proper contain no iron, but the nuclear layer of the rods and cones and the inner nuclear layer contain some iron, as do the internal limiting membrane and, to a lesser extent, the external limiting membrane. In long-standing cases, degeneration of the vitreous occurs, leading to absorption of the capsule with subluxation and shrinking of the lens.

The pigmented epithelial cells of the retina, however, are markedly affected, and the interference with their function accounts for the night blindness complained of early in the disease. Bunge thought that the impregnation of the retinal vessels with iron resulted in a vascular lesion in the retina, thus accounting for hemeralopia and also for degeneration of the retina which may occur without detachment; but the iron is actually in the lymphatic spaces about the vessels and not in the vessels proper. The optic nerve shows iron lying on the surface of the disk. The choroid, the ciliary body proper and its muscle, the sclera and the cornea are not involved because the glass membranes, Bruch's and Descemet's membranes, are impermeable to the diffusion of colloidal iron.

Once siderosis has started, the iron which stains the tissues (and which was in molecular form) gradually passes out through the lymph channels, and new colloidal iron from the intra-ocular foreign body takes its place. This continues as long as the iron is in the eye, but once it is removed no new colloidal iron is present to take the place of the departing molecular iron, with the result that the siderosis clears up. This fortunate result is not common, because usually the foreign body is removed so long after the onset of the siderosis, and the interference with the function of the globe has progressed so far, that the degenerative processes continue unabated.

THE CHEMISTRY AND RAPIDITY OF DEVELOPMENT AND DISAPPEARANCE OF SIDEROSIS

However, Genet saw a case of siderosis in which he removed the foreign body seven months after the injury, with the result that the siderosis completely disappeared, but he did not state how long it took to disappear. Of course, if the amount of staining is not marked, it is much easier to have the pigment absorbed, as was pointed out by Jess, who felt that the amount and rapidity of staining depend on the composition of the iron in the foreign body. This could explain Bride's case in which no signs of siderosis had developed in the seven years during which the eye retained a fragment of steel; however, Bride did not use the slit lamp, which might have revealed the presence of a siderosis not discernible with the loupe. In Kipp's case no siderosis developed during the twenty-five years the eye was under observation. In de Schweinitz' case the siderosis cleared up three and a half months after the removal of the foreign body, which had been in the eye for one year. Ziegler, in discussing de Schweinitz' report, stated that he had had two cases in which successful removal of the iron had not caused a clearing up of the siderosis. Leber, Cramer and von Hippel are the only others who have had the good fortune to see the siderosis disappear after the extraction of the foreign body, while Kipp reported four cases in which this did not happen.

The chemical process which is responsible for the siderosis has been discussed for years ever since von Hippel first stated that there is no difference between the xenogenous and the hematogenous pigmentation of siderotic eyes. It is true that the iron is found in exactly the same cells of the eye in both types except that, according to Hertel, the choroid may be impregnated with iron in the hematogenous cases, whereas in the xenogenous type the choroid is involved only if the foreign body is embedded in the choroid and sclera. Von Hippel found on injecting blood into the vitreous that it took from twenty-eight to thirty-seven days to get a definite blue staining of the epithelial structures of the ciliary processes, the capsule of the lens and the pars ciliaris

retinae. Von Hippel further showed that the pigmented epithelium of the retina takes up the iron particles, and he believed that these cells become phagocytic. In any case, he was certain that the iron is in combination with the albumin of the cytoplasm of the cell without involving the nucleus. However, it is important to note here that in normal eyes d'Amico demonstrated iron in the epithelium of the cornea and conjunctiva, in dissected muscle bundles of the uvea, in the ciliary processes and in the retina. However, this iron is in organic combination and can be demonstrated only by the Grobe-Perls reaction; in siderosis, the iron is present in the form of free ions and can easily be demonstrated by the Berliner blue method or the Perls reaction. The foreign particle of iron must be present in a portion of the eye in which oxidation can take place, otherwise siderosis will not develop, as in the case of Dupuy-Dutemps in which a splinter of iron was removed from the lower part of the angle of the iris after fifteen years without having caused siderosis "because it was in the aqueous where oxygen, carbonic acid and interstitial lymph are lacking." Clegg pointed out the same thing when he stated that if the foreign body is in the lens, on the iris or in the anterior chamber siderosis may not develop, even if the foreign body remains in the eye for years. However, Lloyd reported a case in which siderosis did not develop while the foreign body was in the lens but did develop within seven days after the steel had been withdrawn into the anterior chamber and left there for three days. This rapid onset of siderosis very likely was due to the changes taking place in the steel during its stay in the lens with resultant rapid action by the aqueous once it was brought into contact with the foreign body.

Of course, the composition of the iron is also important, as pointed out by Jess, Lamb and Black, who realized that certain forms of iron or steel fragments are more easily oxidized than others. Furthermore, the foreign body may be encapsulated by a dense fibrous tissue, thus preventing oxidization. Von Graef thought that the iron is in the form of oxides in a molecular form. According to Leber, a solution of iron bicarbonate is formed which is oxidized by the blood and precipitated in the tissues. According to Mayou, however, this cannot be so, for if it were, he maintained, the iron should be deposited evenly in the tissues of the eye and especially where there are blood vessels. However, the lens which is avascular often contains a great deal of iron. Mayou expressed the belief that the iron is in the colloidal form of ferric hydroxide and not in the molecular form of iron bicarbonate, as the latter form should cause siderosis quickly, whereas the shortest time in which he could produce it experimentally was from six to twelve weeks. However, Leber specifically stated that the iron carbonate is oxidized, and this would result in ferric hydroxide. Furthermore, von Hippel reported a case in which siderosis was demonstrated microscopically ten days after the

entry of the foreign body into the eye, and Lamb had a case in which even though the foreign body was removed a day after its entry siderosis was still seen on microscopic examination. However, the time necessary for the development of siderosis is extremely variable. Lloyd reported the case of a patient with a fragment of steel in the ciliary body for fourteen years without siderosis. In fifteen cases of siderosis, Davidson observed discoloration of the iris as early as eighteen days after the entry of the foreign body; indirect siderosis of the lens developed within ten weeks and direct siderosis of the lens within seven weeks. "It may therefore be concluded that the behavior of a magnetic foreign body with regard to siderosis as well as in other ways is incalculable, and no categorical statement as to the minimum length of time that siderosis takes to manifest itself is justified." Davidson also cited the cases of Vossius, Mayou, Mills and Jeacon, Jess, Sattler and Natason to show the variable time which is necessary. In Davidson's series of cases there was none in which the siderosis disappeared after the removal of the foreign body, but he did have three cases in which the progress was checked; however, I do not believe that these cases were followed long enough to decide that the siderosis might not finally disappear. Davidson furthermore reported one case in which the siderosis became worse after the removal of the foreign body, but it is possible that this eye had two foreign bodies and only one was removed.

Mayou's main point is that the iron is in a colloidal form of ferric hydroxide. This is a positively charged colloid, whereas the cells of the eye when they increase their activity become negatively charged, thus attracting the iron to themselves. In the case of the muscle fibers, lactic acid is produced, and this increases the solubility of the colloidal hydroxide, as it is dissolved by weak acids. However, the almost complete absence of iron from the ciliary muscle could be explained as due to the impermeability to colloids of Bruch's membrane, which is continued from the choroid over the ciliary body; the same impermeability has already been shown to be true for the other glass membranes of the eye. The small amount of iron found in the ciliary muscle is present only in the vicinity of the ligamentum pectinatum iridis where the glass membrane is deficient.

According to Vossius, as quoted by Andresen, the staining due to a foreign body can be differentiated clinically from that due to blood. In the latter case there is a greenish staining of the iris, while in the former it is rust-brown. Of course, if a hemorrhage occurs at the time of injury, then a green discoloration can be present together with the brown which is due to the foreign body. Furthermore, in cases of foreign bodies a brown deposit may be present beneath the capsule of the lens, and this, together with the brown discoloration of the iris, would clinch the diagnosis. Vossius further stated that the greenish staining

of the iris occurs in from two and a half to six months, whereas the rust-brown color takes from six months to one and a half years to appear. In those cases in which the siderosis is due to a foreign body there is a blue staining of all, or almost all, of the cell, while in hematogenous siderosis a good part of the cell is brown and only part of it takes the blue color; this is due to the organic combination of the pigment. Hirschberg stated that the discoloration of the iris due to blood disappears after a while, but that due to an iron foreign body remains. Vossius reported a case in which the rust-brown pigmentation of the iris disappeared seven years after the foreign body entered the eye, even though the fragment was not removed and hemeralopia and a complete cataract were present. Undoubtedly an extremely small foreign body had been present and had been completely oxidized. The latter point was also emphasized by Clegg, who stated that siderosis usually occurs in eyes with a small foreign body because large ones cause pain and inflammation, forcing the patient to obtain medical attention early. Clegg further insisted that an eye harboring a foreign body should not be enucleated just because one feared that sympathetic inflammation might ensue. If the foreign body is of copper or brass, then one's fears are justified and an immediate enucleation may be performed, but if the foreign body is of iron or steel one should be more conservative.

INTERPRETATION OF ROENTGEN REPORT IN CASES OF INTRA-OCULAR FOREIGN BODY

Prior to the advent of the roentgenogram as a diagnostic aid in cases of intra-ocular foreign bodies, the magnet was the standby of all oculists. The magnet has been used in medicine for more than two thousand years, but it was first applied to the eye in 1656 by Wilhelm Faby to remove an iron fragment from the cornea of his wife. In 1842, Myer first used it to remove an intra-ocular foreign body through a scleral wound, and McKeown in 1874 removed a foreign body from the vitreous. The first electrical magnet was used in 1879 by Hirschberg, who reported on a hundred cases of extraction of foreign bodies with the magnet. As recently as 1880, siderosis bulbi was not even recognized as a clinical entity, as Vossius himself stated in discussing a case in which the clinical signs were present but were not evaluated at that time.

It should be remembered that the roentgenogram is not infallible in cases of intra-ocular foreign body, as evidenced in the case reported by Lockhart in which the roentgen examination gave negative results four times, and finally a small fragment of steel was removed from the lens. In one of the cases reported by de Schweinitz siderosis was present, and the roentgenogram revealed an extra-ocular foreign body, causing

de Schweinitz to believe that the foreign body was outside the globe and the siderosis was hematogenous in origin. Lockhart, who had a similar experience, came to an exactly opposite conclusion, viz., that there was one foreign body outside the globe, as shown by the roentgenogram, and another intra-ocular foreign body which the film did not reveal.

From the foregoing, then, it is quite apparent that many diverse views are held about siderosis, its pathogenesis and its prognosis, but the following conclusions, I believe, can be agreed on.

CONCLUSIONS

1. The development of siderosis (xenogenous) depends on (*a*) the oxidizable qualities of the iron foreign body, (*b*) the situation of the foreign body in the globe and (*c*) the duration of its stay in the eye.

2. The presence of iron in a cell interferes with its function; removal of the iron may result in complete restoration of function.

3. The iron has an affinity in the eye for cells of ectodermal origin in which it is deposited, but is removed from the globe by histiocytes, cells of mesodermal origin.

4. The affinity of the iron for ectodermal cells in the eye may furnish an important clue to successful vital staining.

5. The presence of siderosis does not necessarily mean enucleation.

6. The glass membranes are impermeable to the particles of oxidized iron.

7. Xenogenous and hematogenous siderosis often can be differentiated both clinically and microscopically.

8. A negative roentgenogram does not exclude the presence of a foreign body in the anterior segment of the globe.

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OCULAR AND ORAL PEMPHIGUS

REPORT OF A CASE WITH ANATOMIC FINDINGS IN THE EYEBALL

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AND
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ST. LOUIS

Ocular pemphigus occurs about once in 46,000 cases of ocular disease. The cause is unknown, the prognosis unfavorable and the treatment of no appreciable benefit. Defined briefly, pemphigus is a systemic disease characterized by successive crops of bullae which may involve the skin, mucous membrane of the respiratory and gastro-intestinal tracts, conjunctivae and viscera. There seems to be a certain connection with atrophic nerve changes. It has been noticed in debilitated persons whose resistance was impaired, but there is no definite proof that debility is the sole cause.

The lesions on the mucosa of the mouth may form small vesicles, but many rupture within from fifteen minutes to one hour after their formation. Some lesions may heal and others form on the mucosa, making it appear as a ragged, grayish-white, macerated membrane; there may also be numerous elevated granulations. In Vincent's angina there is a characteristic punched-out area with a ragged edge as well as definite laboratory findings. Patients with pellagra present redness of the tongue and mouth, mental disturbances, gastro-intestinal manifestations and typical dermatitis on the dorsa of the hands and the back of the neck. Diphtheritic membranes have a more definite location, usually on the tonsils and spreading to the soft palate. Smears or cultures give a basis for a positive diagnosis. Syphilitic involvement of the mouth is characterized by a solitary lesion of the tonsils or of the mucosa presenting slight ulceration and having a round, smooth edge. Agranulocytic angina is differentiated by ulcerations which appear later in the disease, usually in the nasopharynx. The blood shows pronounced leukopenia with considerable diminution of the number of polymorphonuclear leukocytes. Mercurial stomatitis is diagnosed from the history as well as from the presence of severe ptyalism and of gastro-intestinal disturbances. Ulcerative stomatitis usually clears up under proper treatment with antiseptics.

In the eye, the conjunctiva shrinks and is changed to fibrous tissue, causing distortion of the eyelids and shortening of the retrotarsal folds; later the cornea may become involved, resulting in infiltration and drying. Treatment is of little avail. Suppurative and palliative measures, the administration of arsenic, transfusions of blood, roentgen irradiation, the intravenous injection of a 1 per cent solution of mercurochrome and restoration of the culdesacs by the use of split skin grafts are of no permanent value, because of the subsequent contractions of the underlying tissue.

REPORT OF CASE

History.—A woman, white, aged 61, born in the United States, entered St. Mary's Hospital, Superior, Wis., on April 8, 1933, complaining of severe pain in the right eye, intense itching of the right eyelids and considerable soreness in the mouth.

Thirteen months before, she had consulted a physician on account of soreness in the mouth. She was advised that she was suffering from erosions of the soft palate, produced by dental plates. She was ordered to remove the plates permanently, and local applications of silver nitrate were made. She believed that the infection was carried from the mouth to the right eye by the use of a handkerchief which she first placed in her mouth and then wiped against her eye. The condition was accompanied by soreness in the tongue and in the left side of the throat and by enlargement of the glands of the neck. Later the entire mouth became involved. The right eye became black and blue, and blisters extended over the right eyelids and down the cheek.

Nine months before admission, the patient had received weekly intravenous injections of arsenic for a period of eight weeks. Following the injections, a few small blisters appeared in various places over the body, including three blisters on the left arm, two on the abdomen and two on the hip. She treated the blisters with potassium permanganate solution, and they disappeared.

Physical Examination.—The patient was thin and slightly undernourished. Although a year before she weighed 186 pounds (84.3 Kg.), her weight was only 126 pounds (57.1 Kg.). There were no cutaneous vesicles on the body. What appeared to be arsenical pigmentation was present on the arms and legs.

The pupils were equal and reacted to light. There was a mucopurulent discharge from both eyes. Ocular movements were restricted on account of the shrinkage of the conjunctivae. There was extreme scarring and contraction of the conjunctivae, causing considerable shortening of the retrotarsal folds and distortion of the eyelids. Several macerated areas were seen in the culdesacs toward the outer canthus, and there was marked trichiasis of the upper and lower lids of the right eye. There was also a central corneal ulcer of the right eye, 4 mm. in diameter. The cornea of the left eye was clear; there was considerable shrinkage of the conjunctiva in the lower culdesac, but no trichiasis.

The nose showed no excoriations or other signs of involvement.

There were many irregular excoriated areas on the roof of the mouth, the palate, the cheeks and the gums. There was one vesicle on the inner surface of the lower lips.

Although the pharynx was congested and the tonsils were small, they were apparently not involved.

The posterior cervical glands were slightly enlarged.

No abnormalities were found in the chest.

The abdomen was soft, with no tender areas. The spleen and the liver were not palpable. There was some involvement in the anal region.

The knee jerks were present. The Babinski sign could not be elicited, and no ankle clonus or paralysis of the muscles was noted.

The Wassermann test of the blood was negative. The red and white cell counts were normal.

A section through the thickened bulbar conjunctiva near the corneal limbus, showing the thickened covering epithelium, elevated at one side of a bulla, the dark-shaded dense round cell infiltration and the light-shaded foci and masses of cicatricial tissue.

Bacteriologic Examination.—Scrapings from the conjunctivae showed numerous polymorphonuclear leukocytes, a few gram-positive diplococci and thick gram-negative bacilli. Scrapings from the mucosa of the affected area in the mouth showed many epithelial cells, a few polymorphonuclear leukocytes and many bacteria of various kinds, among which were gram-positive diplococci, some staphylococci and gram-positive bacilli.

Course.—On May 10, 1933, a vesicle that had developed in the bulbar conjunctiva of the right eye caused so much pain that the patient begged to have the eye

removed. Vision at that time was limited to perception of light in the right eye and was 20/20 with correction in the left eye. The right eyeball was enucleated on May 11, 1933.

The eyeball was fixed in a dilute solution of formaldehyde (1:10) and embedded in pyroxylin, and horizontally cut sections were stained with hematoxylin and eosin and with Verhoeff's elastic tissue and van Gieson's stains.

Examination of the Eyeball.—The bulbar conjunctiva was everywhere considerably advanced over the periphery of the cornea. The excised conjunctiva was much thicker than normal, showing numerous congested capillaries, edema of the deeply lying connective tissue and a layer of varying thickness of very dense infiltration with small lymphocytes and plasma cells in the outer part of the subepithelial connective tissue; pus cells also were diffusely and thinly scattered among the round cells. The stratified squamous cell epithelium covering the conjunctiva near the limbus was considerably thickened with extra layers of midlying polyhedral and superficial flattened epithelial cells. There was no keratinization. In places, the deeply lying polyhedral cells were separated by thin layers of edematous fluid, revealing the presence of intercellular bridges. A moderately dense, diffuse infiltration with pus cells was observed among the epithelial cells. Numerous downgrowths of greatly varying thickness and depth occurred from the covering epithelium. One very long thin downgrowth extended almost horizontally outward just in front of Bowman's membrane, separating the membrane from the advanced and thickened conjunctiva. This covering epithelium was in many places entirely unattached to the underlying tissue. In places, the epithelium was elevated in small vesicles containing remains of red blood cells. In other places a uniformly thin dense layer of hemorrhage and fibrin lay between the covering epithelium and the underlying tissue or over the latter, uncovered by epithelium. The thickened and infiltrated subepithelial conjunctival tissue contained generally an increased amount of connective tissue. The latter was diffusely arranged; it thickened the walls of the small conjunctival blood vessels and was present in greater amount near the covering epithelium.

Over the cornea, Bowman's membrane was present everywhere except in the center, where the ulcer was located. The anterior epithelium peripherally was considerably thickened and showed numerous small papillae. In most places, the epithelium was unattached to Bowman's membrane. In a few places, it was elevated to form small vesicles containing a few red corpuscles and pus cells. Pus cells diffusely infiltrated the anterior epithelium of the cornea with varying density. In the center, the cornea was thinned considerably as a result of the destruction of the superficial lamellae by the ulcerative process. The substantia propria was diffusely infiltrated with pus cells, which were particularly dense around the ulcer. Many deeply lying capillaries were present, extending toward the center. Around these capillaries there was considerable proliferation of the corneal corpuscles. Throughout the substantia propria, a diffupse proliferation of the corneal corpuscles of moderate degree was observed.

On the posterior surface of the cornea there was a thin layer of dense numbers of pus cells. The remains of red blood cells occupied most of the anterior chamber. The angle of the iris was open but was filled in places with pus cells.

The iris and the ciliary body were atrophic. The iris was diffusely infiltrated to a moderate degree with plasma cells and pus cells. The ciliary body showed considerable new-formed connective tissue in the vascular layer and in the stroma of the ciliary processes. A thin layer of fibrin, red corpuscles and a few young fibroblasts lay on the anterior surface of the lens in the peripheral part of the pupil,

which was dilated by atropine. This pupillary exudate could be followed to its source in the pupillary part of the iris stroma.

The lens showed incipient senile changes with numerous fine vacuoles in the deep layers of the cortex.

The blood vessels of the choroid generally presented a moderate degree of sclerotic thickening. Many small drusen were present.

The optic papilla presented slight edematous swelling.

COMMENT

Löhlein [1] reviewed the pathology of the ocular changes in pemphigus. He stated that d'Amico [2] was the only writer who had reported histologic observations on an enucleated eyeball presenting pemphigus. This eye was removed at autopsy from a 70 year old woman who for about a year had had recurring attacks of vesicles over the entire body and in the right eye. The enucleated eye showed a marginal ulcer of the cornea. The essential change was the chronic inflammatory process in the conjunctiva.

Löhlein wrote that the observations of von Uhthoff, von Michel, Franke, Adam, Speciale-Cirincione, Thost and others had shown that the essential process consisted not in the formation of vesicles but in the deeply invading inflammatory process in the mucous membrane and the submucosa which led to the new formation of connective tissue with subsequent contraction of the membrane.

The case reported here showed considerable general thickening of the bulbar conjunctiva, as a result of dense infiltration with small lymphocytes and plasma cells and edema near the corneal limbus. Newformed connective tissue had developed in considerable quantity, in thin layers or in thicker masses, throughout the depth of the bulbar conjunctiva near the limbus.

The anterior epithelium of the cornea was considerably thickened peripherally and showed many small papillae. The centrally placed corneal ulcer was, of course, secondary to the loss of anterior epithelium resulting from the formation of a vesicle. The deep and severe chronic inflammation of the neighboring conjunctiva would have seriously interfered with the nourishment of the cornea and its defensive powers in combating the ulcerative process. There is little doubt that the ulcer would have perforated at the center of the cornea in a relatively short time.

1. Löhlein, W., in Henke, F., and Lubarsch, O.: Handbuch der speziellen pathologischen Anatomie und Histologie, Berlin, Julius Springer, 1928, vol. 11, pt. 1, p. 138.

2. d'Amico, D.: Sulla istogenesi del pemfigo congiuntivale, Ann. di ottal. e clin. ocul. **53**:219, 1925; reviewed, Zentralbl. f. d. ges. Ophth. **16**:488, 1926.

The presence of considerable old hemorrhage in the anterior chamber seemed to be due to the pemphigus.

The remainder of the changes in the eyeball could be ascribed to the corneal ulcer or to age.

Ocular pemphigus is primarily a disease of the conjunctiva. Changes in the eyeball are therefore always secondary, and it naturally follows that the microscopic study of eyes enucleated because of involvement by the pemphigus process adds little to the knowledge of the essential changes in this disorder.

NEUROFIBROMA OF THE CHOROID

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Neurofibroma of the choroid is a rare condition, but in view of the potential relation which Masson [1] has established between this tumor and melanoma, the report of a hitherto unrecognized form of the disease may be of interest. Two forms of this condition have already been described: (1) localized tumors, sometimes multiple, occurring along the course of the ciliary nerves (Callender and Thigpen,[2] and Phelan [3]), and (2) diffuse neurofibromatosis of the choroid, which in the previously reported cases invariably has been associated with buphthalmos (Knight [4]). This second type is evidently a congenital disease. The case to be reported is related to the second type in that it shows a diffuse neurofibromatous thickening of the choroid but differs in the absence of buphthalmos. The tumor was discovered in the course of a routine postmortem examination.

REPORT OF CASE

A Negro, aged 56, came to the hospital complaining of urinary trouble. Physical examination disclosed a benign prostatic hypertrophy, thickened and tortuous peripheral arteries and a blood pressure of 240 systolic and 100 diastolic. A perineal prostatectomy was performed, and the patient died seven days postoperatively from partial suppression of the urine. No note was made of any ophthalmoscopic examination.

At autopsy the important changes were as follows: fresh adhesions in the left pleural cavity, with a slight excess of pleural fluid; hypertrophied left ventricular wall; numerous small abscesses throughout both kidneys, some of which ruptured into the calices; hemorrhagic cystitis; moderate arteriosclerosis of all the large arteries, and a few fresh areas of necrosis in the liver and spleen. No neurofibromas or other similar tumors were dicovered in any of the organs. The posterior halves of both eyes were removed, fixed in a trinitrophenol formaldehyde solution,[5]

From the Wilmer Ophthalmological Institute of the Johns Hopkins University and Hospital.

1. Masson, P.: Les naevi pigmentaires, tumeurs nerveuses, Ann. d'anat. path. **3**:417 and 657, 1926.

2. Callender, J. R., and Thigpen, C. H.: Two Neurofibromas in One Eye, Am. J. Ophth. **13**:121, 1930.

3. Phelan, H. V.: Multiple Neurofibromatosis of the Nasociliary Nerve, Arch. Ophth. **5**:800 (May) 1931.

4. Knight, M. S.: Neoplasma of the Choroid, Am. J. Ophth. **8**:791, 1925. The bibliography of diffuse neurofibromatosis with buphthalmos accompanies the article.

5. This solution is composed of: solution of formaldehyde, U. S. P., 500 cc.; distilled water, 1,500 cc.; glacial acetic acid, 100 cc.; trinitrophenol to the saturation point.

embedded in paraffin and sectioned serially. Macroscopically, no abnormality of either posterior half was seen. Microscopically, the sclera and the optic nerve with its sheaths were normal. The retina had become detached in the fixation; otherwise, it presented no abnormalities. It was at once apparent that the choroid was considerably thickened, especially in the region of entrance of the optic nerve where it attained from two to three times the normal thickness. Peripheral to this zone, the choroid became thinner, reaching normal dimensions at a distance of from 3 to 4 mm. from the disk (fig. 1). The discoid swelling of the choroid was found on serial section to be symmetrical about the entrance of the optic nerve, the maximum thickness lying in a zone 2 or 3 mm. from the optic nerve, and corresponding to the zone of entrance of the posterior ciliary arteries.

In the area of thickening all of the normal components of the choroid were present, but these were spread apart by a rich growth of fine fibrils running in

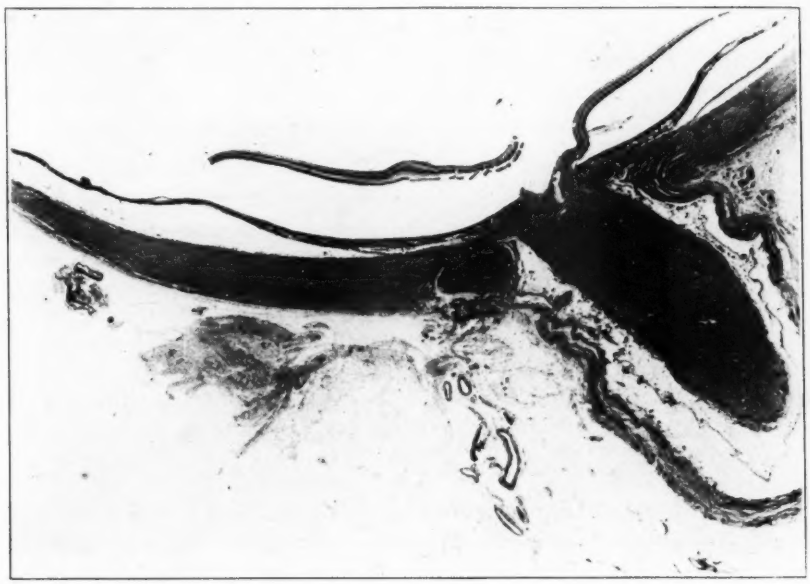

Fig. 1.—Low power photomicrograph of a neurofibroma of the choroid showing the extent of the area of choroidal thickening.

strands and whorls, occasionally branching and crossing one another in a finely meshed pattern (fig. 2). Though the bundles of fibrils are found in all layers of the choroid except the choriocapillaris, they are most thickly developed in the deeper layers, and can be seen here to surround the larger arteries in a dense sheath, the fibrils running circularly or spirally about the vessels. From here they may be traced down to the smaller vessels in the inner layers of the choroid and, much more prominently, through the sclera along the perforating arteries, and even for a short distance back in the orbit along these same vessels. The arrangement of the fibers in whorls about the blood vessels immediately suggests one of the characteristic features of neurofibromas. Scattered throughout the lesion were occasional large ganglion cells, such as are commonly seen in the choroid, and these too were embedded in masses of fibrils.

Figure 3 shows one of the larger arteries near its entrance into the choroid. The intima and media are normal, but surrounding the media there is a somewhat

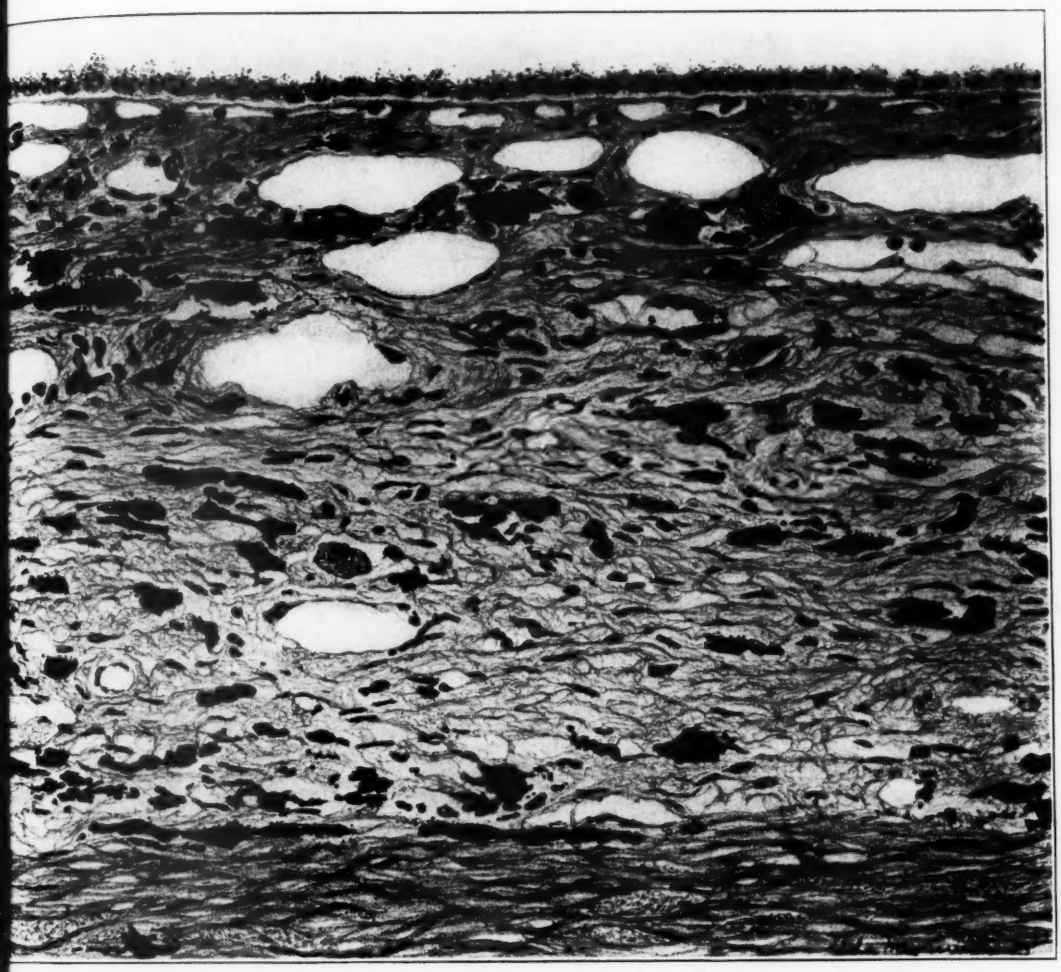

Fig. 2.—High power microscopic drawing showing the distribution of fibrils in the choroid. Several ganglion cells can be seen.

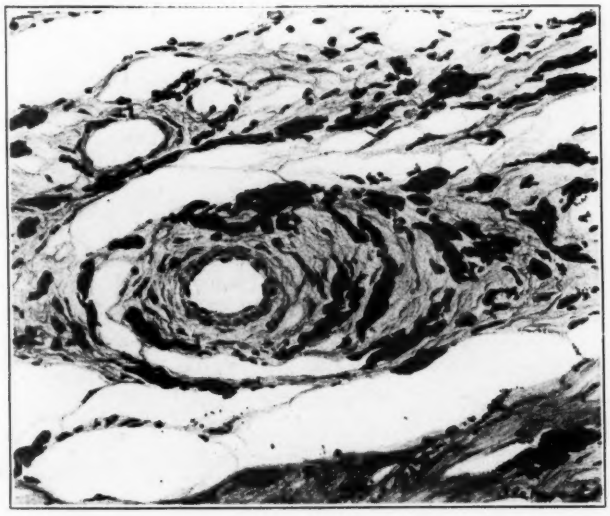

Fig. 3.—Neurofibromatous thickening of the coat of an artery just inside of the sclera.

eccentrically placed mass of fibrils interspersed with large numbers of chromatophores. This swelling extends for a distance of 0.1 mm. along this artery, tapering off at either end. Similar more or less localized nodules were found elsewhere along this and other arteries. Chromatophores were found throughout the tumor; they were most numerous near the entrance of the optic nerve and at the periphery of the lesion. Beyond this, the choroid had a normal appearance. The choriocapillaris, lamina vitrea and pigmented epithelium showed no abnormalities.

COMMENT

I do not intend to review the subject of neurofibromatosis, but it is well to remember that descriptions vary according to the school of histogenesis to which a particular writer adheres. The older school believed that the tumor arose from a proliferation of the connective tissue cells of the perineurium and endoneurium. Verocay [6] and his followers believed that the tumor is of ectodermal origin, arising from the cells of the sheath of Schwann. Accordingly, Knight [4] described certain peculiar ovoid bodies, which were present in the case which she reported, as hyalinized whorls of fibroblasts, while Collins [7] thought they were nerve end-organs similar to pacinian corpuscles. It is curious that Axenfeld [8] viewed the intrascleral loop as a possible neurofibroma, while Kyrieleis [9] felt certain of this view.

In recent years, Masson [1] expressed the belief that the pigmented nevus is closely related to the neurofibroma. It is his belief that the nevus cells are derived from the cells of the sheath of Schwann, that they are nonpigmented in their pristine state and that they are associated with nerve trunks and fibers. In this connection, a recent report by Goldstein and Wexler [10] on melanosis uveae and melanoma of the iris in neurofibromatosis deserves particular attention. My patient showed no signs of Recklinghausen's disease, and a careful study of all the organs, including the brain, failed to show any lesions related to the ocular changes.

The relation of the tumor to the blood vessels was most striking in my case and warrants the conclusion that the growth arose from the perivascular nerve plexus, which is known to be normally very rich in

6. Verocay, J.: Zur Kenntnis der Neurofibroma, Beitr. z. path. Anat. u. z. allg. Path. **48**:1, 1910.

7. Snell, S., and Collins, E. T.: Plexiform Neuroma of the Temporal Region, Orbit, Eyelid and Eyeball: Notes on Three Cases, Tr. Ophth. Soc. U. Kingdom **23**:157, 1903.

8. Axenfeld, T.: Nachweis und Bedeutung meiner "intraskleralen Ziliae Nervenschleifen" am lebendem Menschenauge, Klin. Monatsbl. f. Augenh. **75**:602, 1925.

9. Kyrieleis, W.: Ein Neurinom auf dem Limbus Corneae, Arch. f. Augenh. **119**:119, 1927.

10. Goldstein, I., and Wexler, D.: Melanosis Uveae and Melanoma of Iris in Neurofibromatosis (Recklinghausen), Arch. Ophth. **3**:288 (March) 1930.

the choroid. It was of great interest, therefore, that a similar relation to the blood vessels was discovered in two cases of diffuse neurofibromatosis of the choroid associated with buphthalmos. One of these cases has already been reported by Dr. Knight, who permitted me to study one of her sections, and the other was observed through the courtesy of the curator of the Army Medical Museum. A study of the illustrations of the other published cases of this type suggests strongly that diffuse neurofibromatosis of the choroid invariably has its origin in the perivascular nerve plexus in contradistinction to the discrete type of tumor which arises from the ciliary nerves.

TREATMENT OF UNILATERAL CATARACT WITH CONTACT GLASSES

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As the name implies, a contact glass is a glass that is worn in contact with the anterior segment of the eyeball, touching the sclera, but leaving a space in front of the cornea which is filled with physiologic solution of sodium chloride. Because of their position while being worn, that is, under the lids and against the eyeball, thus eliminating the necessity of "frames," these glasses are advertised as "invisible spectacles."

HISTORICAL REVIEW

This type of glass is not an innovation but dates back to 1878, when Rühlmann stimulated interest in the treatment of conical cornea by requesting that a glass be made with a hyperbolic curve. Nine years later, or forty-six years ago, Fick made the first contact glass.

There have been two methods of manufacturing contact glass, by grinding and by blowing. There are advantages and disadvantages in both methods, the ground glass being more accurate and the blown glass more comfortable to wear.

Fick, in 1887, requested Professor Abbé, who was a director of the Zeiss firm, to provide him with a ground glass having a scleral radius of 12 mm. and a corneal radius of 8 mm. He received four glasses, but it was not until two years later that Himmler pointed out that these glasses were not ground but skilfully blown.

In the same year, and quite independently, Müller, in his inaugural dissertation at Kiel, described his work with blown contact glasses which he had carried out in conjunction with Himmler.

Fick, in 1892, still desiring more accurate work, ground the two segments separately—one for the sclera and the other for the cornea—and then cemented the parts together.

Müller himself had a myopia of 14 diopters, which he reduced to 1.5 diopters with contact glasses, but he could wear them only for half an hour at a time.

At this time it was recognized that the ideal combination for comfort and optical accuracy would be obtained by grinding a blown glass, and as a result efforts were made, but these were and still remain unsuccessful.

Read before the New Haven County Medical Society, Oct. 26, 1933.
From the Wilmer Ophthalmological Institute, while the author was Resident.

In 1913, Ergelet revived the subject of contact glasses in treating aphacia, and Siegrist, in 1919, stimulated the interest in treating conical cornea. Von Hippel, in 1919, became a staunch advocate of the Müller blown glass. In 1922, Zeiss placed on the market a set of ground contact glasses which are the glasses widely used today.

In 1929, Deutsch extended the application of contact glasses to the treatment of irregular astigmatism.

Rapid strides have been made in the past few years, large clinics having developed; of especial significance is the one of Professor Heine. In England, Rugg Gunn and Rycroft have been writing extensively on the subject.

PRESENT-DAY USES

The indications for the use of contact glasses as summed up by Rycroft are: (1) cases of advanced conical cornea in which correction with spectacles offers no improvement and in which there is no great opacity of the corneal apex; (2) cases of old irregular ulceration in which the ensuing scars have no great density; (3) cases of neuroparalytic keratitis in which corneal anesthesia has hitherto called for tarsorrhaphy to prevent external injury, and (4) selected cases of higher refractive errors.

Professor Heine gives the following additional indications for the use of contact glasses: in the application of ointment in ulcus serpens of the cornea; in sclerotic keratitis, acne rosacea, vernal catarrh, pemphigus, scleroderma, hay fever, kerato-iritis dystrophia marginalis and lagophthalmic keratitis and in many cases of iritis; as a splint after plastic operations; in nystagmus and color blindness and, when tinted, for cosmetic and climatic purposes. Of especial interest is the prescribing of tinted contact glasses for actors and singers for purely cosmetic purposes.

The disadvantages may be annotated as follows: 1. An easy method of insertion, suitable for all patients, has not yet been found. 2. Discomfort is invariably experienced at first, if the glasses are not accurately fitted, and often leads the patient to discontinue wearing them. Some patients become accustomed to them at once, while others are afraid to persevere and soon give up. A person who wears the glasses successfully should tolerate them at least six hours. 3. They are costly, about from $25 to $30 each. 4. They may be a potential source of danger to the eye in case of injury, though no such case has yet been recorded. Rugg Gunn holds the view that this possible danger is less than that of a broken spectacle lens.

This is in general the situation today in regard to contact glasses. The following report of a case should stimulate renewed interest in their application.

REPORT OF CASE

On Nov. 21, 1929, a youth, aged 17, presented himself with the complaint of black spots in front of his left eye of from six to eight months' duration. These spots had gradually become larger and greater in number, until within from two to three months from the onset the patient could detect only hand motion with this eye. His right eye had remained symptom-free.

Examination revealed the right eye to be normal both externally and on study with the slit lamp. Ophthalmoscopically, there were a few spots of old chorioretinitis in the periphery of the right eye. The field was normal, and the vision was 20/10 — 2. The left eye was normal externally except for a manifest cataract. Examination with the slit lamp revealed the lens to be irregularly opaque with flocculent areas, streaks and spots of dense opacities on a less dense background. There were a few granules of pigment on the anterior capsule. The field was normal for large objects, and the vision in the left eye was hand motion at 4 feet (1.2 meters). Tests with the perforated disk were poorly performed, but the patient had good perception and projection of light at 20 feet (6 meters). A diagnosis was made of a unilateral complicated cataract of the left eye.

An exhaustive survey of the patient's general condition was made in an attempt to determine the etiology of the cataract. The only positive findings were an alveolar abscess and bilateral maxillary sinusitis; both infections were cleared up.

The problem of operation then presented itself. It was and still is an open question whether or not one should remove a unilateral cataract. There are arguments in favor of and against operation. The majority of the patients usually are operated on for one or more of the following reasons: 1. The black pupil which follows the removal of a cataract is less disfiguring than the white one which exists when a patient has a mature cataract which is quite noticeable. If the patient elects to have the cataract removed for this reason, he is entitled to the operation. 2. He will have useful vision in the eye following extraction, that is, he will get so-called gross vision which will enable him to see chairs, doors, people, etc., that he could not see with a mature cataract. However, most patients soon learn to keep the head tilted slightly toward the side of the lesion and soon become completely adjusted to unilateral vision, if they do not have the cataract removed, just as people do who lose one eye. However, if the patient elects to have the cataract removed for this reason, he should be entitled to the operation. 3. The danger of secondary glaucoma following swelling of the lens, especially in traumatic cataract, may be greater than the occasional secondary glaucoma seen after extraction, and for this reason it is legitimate to remove the cataract.

The arguments against removing a unilateral cataract are: (1) the economic loss to the patient while he is hospitalized, for which he gets very little compensation, such as return of vision, and (2) the danger of sympathetic ophthalmia, which is small but definitely present following intra-ocular operations.

In other words, when the question arises whether one should remove these cataracts, the evidence fairly weighed is in favor of removal. However, some of the leading ophthalmologists oppose it, while others leave it entirely up to the patient, because, as they argue, the patient cannot use the eye after the cataract is removed. Some advise against removal until the patient loses the sight in his sound eye.

In the case reported here, it was elected to remove the cataract.

On Dec. 3, 1929, the operation was performed by Dr. Wilmer, who used a keratome incision, iridectomy and the lavage method. Uneventful recovery followed, and the patient was discharged from the hospital on December 13, ten days later. On discharge his vision was 20/200, owing to a rather dense capsule and some unabsorbed hemorrhage on the capsule.

On Jan. 19, 1930, the patient was readmitted for discission on the left eye. By this time enough of the capsule and hemorrhage had absorbed so that vision in the left eye had improved to 20/70. On January 22, discission was performed, and again an uneventful convalescence followed. The patient was discharged on January 25, three days later, with vision of 20/10 in the right eye with no glass. Vision in the left eye was 15/200; with + 10 sph., + 1.25 cyl., axis 170, it was 20/15 — 1; with + 3.50 sph. added the patient could read Jaeger test type 1 readily at 10 inches (25 cm.). In other words, he had better than normal vision in either eye with glasses, but as he could not wear glasses he had vision of 20/10 in his right eye and 15/200 in his left eye for all practical purposes.

The patient was then told, as has always been the custom in such cases, that although he had an ideal result, he would not be able to use his left eye. The two eyes would not work together, one with no glass or a very thin glass, and the other, in which the lens had been removed, with a thick lens such as a + 10 sphere.

The simile was that "one can't hitch a horse and goat together and expect them to work." The patient was encouraged, however, by being told that he would now have gross vision in the eye from which the cataract had been removed, which he did not have before, and that he would not stumble into doors, chairs, people, etc., all of which would, no doubt, be of some advantage, although the vision was very small compared to what he might have if he could wear a heavy glass without confusing his good eye. The patient was still further assured that in case anything happened to his good eye, a thick cataract lens could immediately be given him for the opposite eye and he would be able to use it. After already losing the sight of his eye, which was a serious shock in itself, but being rewarded with an excellent operative result, the patient now could expect to use the eye on which operation had been performed only if something happened to his good eye. This was not a very bright outlook.

Nothing more was heard of the patient until Feb. 12, 1933, when he returned complaining of a few black spots floating around in front of his right eye (his good eye). As this was the way the left eye was first affected, he was duly alarmed.

Examination revealed no new changes, except that the left eye had diverged 55 degrees as measured on the perimeter, owing to disuse. The patient was working as a salesman and found the cosmetic defect very embarrassing. The internal rectus muscle of the left eye was not paralyzed, as there were good internal rotation and good converging power.

It was explained to the patient that a contact glass might be tried in his left eye and that with the good vision in this eye, which was still 20/15 corrected, it might swing back to its normal position; however, if it did not swing back an

operation could be performed on the muscles, such as resection of the internal rectus muscle and controlled tenotomy of the external rectus muscle. He was advised that when the eyes were straight again, the vision with a contact glass might hold them so—at least I thought it might, although I had never tried it before. The patient was much interested in the procedure, being very intelligent and cooperative, and carried out the instructions to the last letter. As he was working at the time, treatment was confined to Saturday afternoons and one or two evenings in the week, for a period of four months.

On February 18, a prism of 55 degrees was placed in a trial frame, base in; a contact glass was placed in the patient's left eye which gave him 20/15 vision. The patient wore both all afternoon, getting single binocular vision. One week later single vision was secured with a 50 degree prism and contact glass. He complained of considerable "pull" at first, which gradually decreased. At no time was the patient unable to wear the glass less than four hours, and he usually wore it from five to six hours before experiencing any discomfort. On March 4, a 45 degree prism was used; some weeks the patient came in one evening and some weeks two evenings. Each time he returned a decided improvmeent in his divergence was noticed, and he was told that an operation on his muscles seemed less and less necessary. On March 25, a 12 degree prism was all that was needed to get single vision. On May 6, single binocular vision was obtained without any prism, but always, of course, with the contact glass. The patient became quite expert at inserting and removing the glass, and after the third time needed no assistance.

He wore the glass steadily until July 15. He now wears the glass every morning, removes it during the noon hour and then reinserts it for the afternoon, removing it for the night some time in the evening. His eyes remained straight from May 6 until July 15.

On July 15, the patient was called out of town because of serious illness in the family and remained in the country for six weeks, during which time he was without his contact glass. During this period the left eye again began to diverge and was 20 degrees divergent when he returned to the city. He immediately inserted the glass, and within three hours the eyes were again straight. Examination on September 4, revealed orthophoria for distant and for near vision, abduction of 5 degrees and adduction of 15 degrees at 20 feet. The patient has the use of both eyes for all distant vision, and uses his right eye for any close work.

Reports of a few more similar cases would be exceedingly appropriate before final conclusions are drawn. When results such as those in this case can be obtained an entirely new future is ahead of the patient with a unilateral cataract. He can be told before the operation that he will probably be able to use the eye and that he will have not only gross vision, but also practical vision, depending on the success of the operation. The entire approach to the question as well as the prognosis given by the ophthalmologist should be much brighter in the future from the ophthalmologist's as well as from the patient's point of view.

PARALYSIS OF DIVERGENCE

WILLIAM H. STOKES, M.D.
OMAHA

If, in the routine examination of eyes, systematic tests are made of ocular muscle balance, anomalies of convergence and divergence are often found. Paralysis of divergence, however, is a condition which appears infrequently. In the available literature there are fifty recorded cases. When one considers that nine were seen by Duane [1] and nine by Alger,[2] the condition cannot be so rare as the small number of reported cases would indicate. It is possible that many are overlooked and pass unrecognized, because little reference to this subject is made in textbooks of ophthalmology and neurology.

The occurrence of this unusual paralysis in two members of a family (father and daughter) is mentioned in the literature by Stoelting.[3] It seems a rather curious coincidence that the patients in two of the cases reported here are sisters (cases 1 and 2). The patient in case 3 had had paralysis of divergence for twenty-five years, and had worn prisms for relief. In case 4, the paralysis disappeared two months after the first observation. In case 5, paralysis of divergence was complicated by an excess of convergence.

REPORT OF CASES

CASE 1.—Miss M. A. F., aged 68, consulted me on Oct. 30, 1933. Refraction was done in February, 1911, by the late Dr. Harold Gifford, and there was no reference in the history to any muscular insufficiency at that time. For the past twenty-two years the patient had worn the glasses given her at this examination. She had had no discomfort from distance vision, and always removed her glasses for near work, although she had special reading glasses.

Two months before consulting me, she suddenly began to see double. The diplopia was accompanied by a severe headache, which persisted. This ocular symptom was distressing when she looked in the distance, but she had little trouble when she was indoors, and at the reading distance there was no double vision.

Examination showed normal pupillary reflexes for light and accommodation; the consensual reflex was present. The pupils were normal in size and were equal.

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1. Duane, A.: Paralysis of Divergence, Ophthalmology, Milwaukee **2**:1 (Oct.) 1905.

2. Alger, E. M.: Paralysis of Divergence, Tr. Am. Ophth. Soc. **14**:665, 1916.

3. Stoelting, in discussion on Bielschowsky, A.: Ueber die sogenannte Divergenzlähmung, Ber. ü. d. ophth. Gesellsch. **28**:110, 1901.

Ophthalmoscopic examination showed nuclear opacities of the lens, but there was no difficulty in viewing the fundus. The nerve heads were normal. The retinal vessels showed marked angiosclerotic changes; there were no exudates or hemorrhages. The peripheral field was normal. Refraction gave the following result: in the right eye, with —4.50 —1.00 cyl., axis 90, vision was 20/25+, and in the left eye, with —4.75 —1.00 cyl., axis 90, vision was 20/25+.

The patient showed a moderate convergent squint, and she could fix with either eye (cover test). With and without the foregoing correction, there was homonymous diplopia at 20 feet (6 meters) in all parts of the field of fixation and at all ranges, but it was most marked when the eyes were directed straight to the front. The diplopia diminished somewhat when the patient looked to the right or to the left. There was also a slight diminution when she looked up, and a slight increase when she looked down. The amount of diplopia decreased proportionately as the test light was brought toward the patient, until at the near reading distance there was binocular single vision. On approaching the near point of convergence, there was immediate crossed diplopia.

At 20 feet an 8 degree prism base out over each eye (red glass over one eye) gave binocular single vision; at 10 feet (3 meters), a 6 degree prism base out, and at 5 feet (1.5 meters), a 4 degree prism base out. The diplopia diminished gradually as a small test light was carried toward the eyes, and a point of binocular single vision was reached (without prisms) at 80 cm. from the eyes (single vision by approximation, Duane). As the test light was brought nearer and approached the convergent near point, there was crossed diplopia at 12 cm. from the eyes. When the test light was slowly carried away, homonymous diplopia reappeared at a distance of 1 meter. There was no restriction in the outward movement of either eye, and there was no nystagmus.

The patient reported the next day, and the measurements of the diplopia were found to be exactly the same. Her glasses were changed to the correction found, but prisms were not prescribed; instead she was advised to wear an occlusion disk over one eye.

Three weeks after this first examination the patient returned. The subjective symptoms had increased in severity, and there were vertigo and nausea. An apparent movement of objects was noticed, not only when both eyes were used but also with one eye alone.[4] (She had worn the occlusion disk constantly over the left eye.) Muscle tests gave the following results: Homonymous diplopia at 20 feet was relieved with a 6 degree prism base out over each eye (red glass over the left eye). The diplopia disappeared on approximation at 40 cm. There was crossed diplopia at 8 cm. from the eyes, and homonymous diplopia reappeared by recession at 60 cm. The patient had single vision for distance without red glass when she wore full myopic correction combined with a 4 degree prism base out over each eye. For this reason glasses were ordered as follows: for the right eye, —4.50 —1.00 cyl, axis 90 with 4 degree prism base out; for the left eye, —4.75 —1.00 cyl., axis 90 with 4 degree prism base out. The glasses were removed for the near reading distance.

The patient returned in two weeks and stated that all symptoms had disappeared. Dr. F. W. Niehaus reported that the results of her general physical and neurologic examination were negative. There was a trace of albumin in the urine, and hemoglobin was 80 per cent.

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4. Sachs (Beiträge zur Lehre von den Augenmuskellähmungen, Arch. f. Augenh. **37**:9, 1898) called attention to this feature in which, although the disease is bilateral, monocular projection may be interfered with.

CASE 2.—Mrs. C. E. J., aged 71 (sister of Miss M. A. F.), was seen on Oct. 28, 1933. Three years previously she became conscious of double vision, which appeared suddenly and persisted. When she looked in the distance she saw double, which was confusing, especially in the evening when she was at the theater. She did not notice the double vision when she was at home, and it did not interfere with reading. Two years previously her glasses were changed, but without relief. At first the diplopia was much more confusing than when I saw the patient. She thought that she had become accustomed to it. However, she did not wear glasses for distance. There were no headaches, vertigo or nausea.

Examination of her eyes showed a slight manifest convergent squint. The pupils were normal in size, were equal and reacted to light and in accommodation. The fundi showed a few floating opacities of the vitreous, and marked arteriosclerotic changes of the retinal vessels were present, but there were no exudates or hemorrhages. The peripheral field and intra-ocular tension were normal. Vision was 20/20—2 in the right eye with + 0.25—1.00 cyl., axis 85, and 20/25 in the left eye, with + 0.50 — 1.125 cyl., axis 90. The reading addition for the right eye was + 2.50 and for the left eye, + 2.75.

The movements of each eye showed normal excursion in all directions. When the eyes were directed straight to the front, the patient fixed with the right eye. The diplopia was homonymous and was greatest at a distance of 20 feet or more and diminished as the test light was carried toward the eyes. Owing to the forced position of the left eye, the diplopia increased slightly when the patient looked to the left, but it decreased once more when she looked still further to the left. The outward excursion of the left eye, however, was normal. The patient undoubtedly had a slight secondary contracture of the left internal rectus muscle.[5] When the test light was carried to the right, the diplopia decreased slightly. At 20 feet, binocular single vision was obtained by the introduction of an 8 degree prism base out over each eye. Single vision by approximation was secured at 51 cm. from the eyes and by recession, up to 77 cm. There was crossed diplopia at 11 cm. All the foregoing tests were made with red glass over the left eye.

Glasses without prisms were ordered, because the patient had apparently learned to suppress the false image. She wants bifocal lenses, because she uses her glasses only for reading. On reexamination a month later the condition of her muscles was exactly the same.

General physical examination by Dr. Frederick Niehaus showed arteriosclerosis with vascular hypertension and a blood pressure of 190 systolic and 100 diastolic.

CASE 3.—Mr. A. R. K., aged 63, was seen on Nov. 30, 1931. His history revealed that he had worn glasses for the past twenty-five years. At the age of 38 he was conscious of sudden diplopia. He remembered that he had a "muscular paralysis" for which a 4 degree prism was ordered for each eye. They relieved the double vision, and he continued to wear the prisms. The glasses which he was wearing when he consulted me were ordered one year previously, when he was given the following correction: for the right eye, + 0.37 cyl., axis 165 combined with 4 degree prism base out; for the left eye, + 0.37 cyl., axis 180 with 4 degree prism base out. He had bifocal lenses with a + 2.50 addition for reading and a prismatic correction of a 4 degree prism base out in the lower segment.

His chief complaint was an inability to read more than five minutes at a time. For this reason he had given up almost all close work. Examination showed

5. Duane[1] noticed that a slight restriction of outward movement occurred in the squinting eye after the condition had lasted for some time.

vision of 20/20 in each eye. The fundus was normal. Pupillary reflexes were normal. There was no restriction in outward movement of either eye; the outer margin of the cornea was readily carried to the external canthus. Without glasses he had homonymous diplopia for distance which was relieved by an 8 degree prism base out. The diplopia decreased slightly in lateral gaze. Single vision by approximation was secured at 30 cm.; diplopia appeared by recession at 38 cm., and crossed diplopia, at 11 cm. from the eyes. The muscle test showed orthophoria at 16 inches (40.6 cm.) from the eyes with + 2.50 spherical correction.

Glasses were ordered as follows: for the right eye + 0.37 cyl., axis 165 combined with 4 degree prism base out; for the left eye, + 0.37 cyl., axis 175 combined with 4 degree prism base out for distance. For reading and near vision, separate glasses were prescribed—for the right eye, + 2.50 + 0.37 cyl., axis 165; for the left eye, + 2.50 + 0.37 cyl., axis 175, without a prismatic addition.

The patient returned on Dec. 1, 1933. He had worn the separate distance and reading glasses and had been able to read with comfort. Reexamination of his eyes confirmed the foregoing findings in all respects.

CASE 4.—M. L., aged 7, was seen in November, 1932. Six weeks previously she had an acute febrile disease accompanied by headaches and some signs of meningeal irritation, diagnosed by the family physician as encephalitis. Very early in the course of this illness the child complained of double vision, and a distinct "crossing of her eyes" was noticed.

On examination, the child had 20/20 vision. Pupillary reflexes were normal. The lateral rotations were normal, and there was no evidence of motor paralysis. For distance, there was homonymous diplopia of 10 degrees. The diplopia did not increase to the right or left; it diminished as the fixation light was carried toward the eyes and disappeared at 12 inches (30.5 cm.). Single vision by recession was not measured. On reexamination two months later, there was no diplopia, and all muscle tests gave normal results.

CASE 5.—Mrs. W. E. T., aged 32, was seen on Oct. 10, 1933. She complained of asthenopia, headaches and diplopia on distance vision. The diplopia was very marked when she was tired. At the age of 10, she suffered from a febrile disease, which she thought was scarlet fever. Since then the eyes had been crossed, and from that time on she had had double vision. She had worn glasses ever since, but without comfort.

Examination showed normal pupillary reflexes. The peripheral field and fundus were normal. The patient was fixing with the left eye. The right eye showed a convergent squint. Under homatropine, with + 3.75 cyl., axis 105, vision in the right eye was 20/20—2, and with — 0.50 + 3.75 cyl., axis 75, vision in the left eye was 20/20 + 1. A postmydriatic test two days later showed vision of 20/20 in the right eye with — 0.25 + 3.75 cyl., axis 105, and vision of 20/20 + in the left eye with — 0.75 + 3.75 cyl., axis 75. With this correction and with red glass over the right eye, there was homonymous diplopia of 24 degrees. This was reducible sometimes by effort to 18 or 20 degrees. The diplopia did not increase when the patient looked to the right or to the left, but decreased when the test light was brought toward the eyes. Single vision by approximation was secured at from 14 to 15 cm.; diplopia reappeared by recession at 20 cm., and crossed diplopia, at 6 cm. At 16 inches (40.6 cm.) esophoria measured 20 and at 8 inches (20 cm.), 12, while at 6 inches (15 cm.) there was orthophoria. Full refractive correction was ordered, but without prisms.

On November 15, the patient returned. The diplopia and headaches were worse, and she was again using her old glasses which corrected her vision in the

right eye to 20/30 and in the left eye to 20/20. Homonymous diplopia of 24 degrees was still present. With correction and by effort, the patient sometimes reduced the diplopia to 12 degrees. At 16 inches with correction, the esophoria measured 18, and at 8 inches with correction, 10; at 6 inches there was orthophoria. She had single vision by approximation at 13 cm.; by recession, at 16 cm. There was crossed diplopia at 10 cm. There was no limitation in the movements of either eye. At this time glasses were ordered, for trial, with full correction and a 5 degree prism base out over each eye. The patient returned in two weeks and stated that she was unable to wear the correction because of diplopia.

In this case there is in addition to the paralysis of divergence, a complicating excess of convergence. This was the case when the accommodative element was eliminated by correction of the refraction. The deviation for distance was too great for prismatic correction, and the patient was advised to have each external rectus muscle resected. She is considering the operation.

DIAGNOSIS

Paralysis of divergence was first described by Parinaud [6] in 1883. In his second publication on the subject, in 1886,[7] he stated that the paralysis cannot be recognized except by the character of the diplopia, which is in the median plane only, appears at certain distances, is homonymous, with slight separation of the images, and persists without notable modification in all directions of gaze. In the same year, Theobald [8] described a case of convergent strabismus in a 39 year old woman. This patient had squint and homonymous diplopia for ten years. The diplopia appeared on distance vision only, while on near vision she had binocular single vision. Theobald did not recognize this as paralysis of divergence. Stoelting's [9] case resembles those described by Parinaud, but the record shows that the condition was marked convergence excess, which was increased by the wearing of prisms. Uhthoff,[10] in 1893, called attention to the fact that there was, in paralysis of divergence, a decrease in the amount of the diplopia as the eyes are carried to the right and to the left. This observation was confirmed by Straub,[11] who stressed that the test object should be carried along an

6. Parinaud, H.: Paralysies des mouvements associés des yeux, Arch. de neurol. **5**:145 (March) 1883.

7. Parinaud, H.: Paralysis of the Movements of Convergence of the Eyes, Brain **9**:330, 1886.

8. Theobald, S.: A Case of Convergent Squint, Associated with Myopia, Arch. Ophth. **15**:191, 1886.

9. Stoelting and Bruns: Ueber Lähmungen der Convergenz und Divergenzfähigkeit, Arch. f. Ophth. **34**:92, 1888.

10. Uhthoff, W.: Ein Fall von stationärer gleichnamiger Diplopie im Sinne einer Divergenzlähmung, behandelt durch Tenotomie eines Rectus internus, Berl. klin. Wchnschr. **30**:370, 1893.

11. Straub, M.: Ueber Lähmung der Divergenz, Central. f. prakt. Augenh. **21**:8, 1897.

arc of a circle, so as to maintain a constant distance from the eyes. This diagnostic feature of the paralysis, however, is not always present, but should be looked for in all cases. Bielschowsky,[12] in 1900, noticed that there was a distinct tendency for the diplopia to decrease when both eyes were directed straight up, and that the diplopia increased when the patient looked down. With correcting prisms there was still homonymous diplopia on downward gaze, even though binocular single vision existed for distance. This he explained on mechanical grounds. Physiologically, the eyes tend to diverge slightly when directed up and converge when directed down. A pathologic homonymous diplopia, otherwise constant, is always less in the upper, and greater in the lower, field. Von Hippel,[13] in 1902, after performing tenotomy in a case of paralysis of divergence, came to the conclusion that if it is possible by tenotomy of the internal rectus muscle to produce single vision for distance without diplopia in the lateral gaze, the diagnosis of paralysis of divergence must be incorrect. Duane,[1] in 1905, presented the best and most complete study of this condition. He stated that the characteristic phenomena are the sudden development of homonymous diplopia with marked convergent squint, with or without vertigo, false projection and an apparent movement of objects. The amount of diplopia for distance and of squint measured in degrees decreases with almost mathematical regularity as the object looked at is brought toward the patient, until at a certain definite distance there is binocular single vision. At the point where this begins, there is still a slight tendency to undue convergence, but at near distance, esophoria changes at first to orthophoria (equilibrium) and then almost immediately to exophoria. The exophoria increases down to the convergence near point. In almost all cases, but particularly if there is much complicating excess of convergence, it will be observed that when the object of vision is brought so close that it is seen single (single vision by approximation), the patient can still hold the images together when prisms base in of several degrees' strength are placed before the eye or when the object is slowly carried off again a considerable distance (single vision by recession).[14] Homonymous diplopia and convergent squint usually

12. Bielschowsky, A.: Ueber die sogenannte Divergenzlähmung, Ber. ü. d. ophth. Gesellsch. **28**:110, 1901.

13. von Hippel, E.: Ueber Divergenzlähmungen, München. med. Wchnschr. **49**:122, 1902.

14. For the difference in these distances, Alger[2] gives the following explanation: "Paralysis of divergence automatically results in stimulation of convergence as the fixation point is approached to the eyes. When it is carried away from them, convergence is automatically relaxed and, though in this case it cannot be accompanied by any increase in the paralyzed function of divergence, the very relaxation permits some single vision by recession."

diminish somewhat as the eyes are carried to the right or to the left. The excursion of the eyes is normal in all directions. Only after the condition has lasted for some time can a slight restriction of outward movement be observed. The deviation and diplopia may increase at first until a certain maximum is reached; then they usually remain the same for months or even years. Duane also added that paralysis of divergence which has lasted for some time is often followed by an excess of convergence occurring either as a more or less transitory spasm or as a continuous steady overaction of convergence. The result is that the mathematical decrease in the amount of the deviation when the test object is brought toward the eyes can no longer be preserved, but the angular amount of the deviation and of the diplopia tends to become more nearly alike at all ranges. The forced position of the squinting eye produces apparently some secondary muscular changes, i. e., contracture of the internal and stretching and weakening of the external rectus muscles. Thus the range of inward movement in the affected eye is increased, and the range of outward movement is actually diminished.

Zentmayer,[15] Duane and others also have reported cases in which paralysis of divergence may be complicated by a paralysis or spasm of one of the vertical muscles, or there may be an associated paralysis of up or down movements. Again, it may be complicated with a paralysis of convergence or it may be preceded or followed by a paralysis of one or both of the external rectus muscles (cases of Parinaud, Duane and others).

Vom Hofe[16] described another symptom which has not appeared before in the literature. His patient, having a homonymous diplopia for distance, also noticed that distant objects appeared to be magnified. This is explained by a spasm of the ciliary muscle; the increase in the impulse of enervation is the result of the difficulty of parallelism.

DIFFERENTIAL DIAGNOSIS

The diagnosis of paralysis of divergence may be confused with a paralysis of the external rectus muscle, bilateral or unilateral. The characteristic feature of diplopia due to paralysis of individual muscles should not offer any difficulty. The variation in the amount of diplopia in the different directions of gaze, the increase in the amount of diplopia in the direction of the normal field of operation of the paralyzed muscle and the limitation of motion in the field of action of the

15. Zentmayer, W.: Report of a Case of Paralysis of Divergence, Tr. Am. Ophth. Soc. **13**:521, 1913.

16. vom Hofe, K.: Ueber Divergenzlähmungen, Ztschr. f. Augenh. **61**:54, 1927.

paralyzed muscle are characteristic signs of muscular paralysis, which are absent in paralysis of divergence. An accurate diplopia chart is the greatest aid in establishing the diagnosis.

DIVERGENCE INSUFFICIENCY

Insufficiency of divergence is usually secondary to a previous excess of convergence although it may be primary, and it usually has many of the features of the latter. Often it is a fatigue phenomenon and is not stable in its manifestations. A history of sudden development of spontaneous diplopia and of other subjective symptoms is more often absent. If diplopia is noticed in insufficiency of divergence, the amount is not marked. It is often less for distant objects and greater for near. It is much increased by the use of the accommodation. The diplopia becomes less and disappears after rest. Duane called attention to the fact that at any given distance the amount of diplopia is always less than the amount of screen deviation. The range of single vision, by recession of the test light, is large in insufficiency of divergence and small in paralysis of divergence.

CONVERGENCE SPASM AND CONVERGENCE EXCESS

Accommodative and nonaccommodative excess of convergence may appear under the guise of a tonic, sometimes suddenly developing and suddenly varying spasm of convergence. This condition is never stable, but varies from day to day. Both eyes assume a position of extreme convergence at every attempt to perform fixation, either for far or near vision. The pupils at the same time are contracted, and the accommodation is at a state of spasm. The eyes may be so fixed in a condition of convergent spasm that they can move out little or not at all. The condition is then mistaken for paralysis of the abducens. Often there is nystagmus, which is usually horizontal, is much more marked on fixation and is associated with a contracted pupil. The nystagmus is intermittent. Every minute or so an extremely rapid pendulum motion is noticed in the horizontal plane, and after about from six to ten rapid twitchings the eyes are again quiet. Spasm of convergence is seen in hysteria and in traumatic neurosis.

If the diplopia or the deviation is due to an excess of convergence, the diplopia increases as the test object is brought nearer to the eyes and is negligible at a distance of 20 feet. This seems to be the reverse in paralysis of divergence.

ETIOLOGY

Convergence consists in a simultaneous contraction of both internal rectus muscles combined with a simultaneous relaxation of both external muscles. Divergence, therefore, would necessarily consist in exactly the

reverse process. There are some observers who do not agree with this view, and it is maintained that divergence is simply a relaxation of the internal rectus muscles, allowing the eyes to return to a position of rest, the natural position of rest being that of slight divergence. Parallelism, then, requires a certain tonic and constant contraction of the internal rectus muscles for its maintenance. Duane,[17] however, believed that the position of perfect physiologic rest is not one of divergence, and that the lateral separation of visual lines must be regarded as an active process due to simultaneous contraction of the external rectus muscles. Straub [11] expressed the belief that there is a center for divergence, which controls the two abducens nuclei and acts antagonistic to the convergence system.

The center for convergence has been fairly definitely established, and the assumption that Perlia's nucleus is concerned with the movements of convergence has received almost universal acceptance. Physiologic and pathologic facts necessitate the presence of a center for divergence, even though no reference to an active voluntary divergence of the eyeballs appears in the literature.

Perinaud thought that the lesion which is responsible for this paralysis of divergence might be located in the cerebellum. Duane,[1] however, placed the center in close relation with the two abducens nuclei, the actions of which are coordinated by a tract affecting the function of divergence. He strengthened this argument by stating that a bilateral paralysis of the abducens may be converted into a paralysis of divergence, and that this paralysis may pass into paresis of the abducens. Holden [18] argued that:

> The impulse which turns both eyes to the right arises from the right abducens nucleus and if this impulse were sent from the abducens nucleus in a normal measure to the right external rectus and incompletely to the left internal rectus, the result would be divergence of the two eyes and not the convergence which is found in these cases. Could we assume that the impulse which turns the eyes to the right arises from the nucleus of the left internal rectus, an interruption of the association fibers in the longitudinal fasciculus would prevent the full impulse from reaching the right external rectus and thus lead to convergence of the eyes. But since this assumption seems untenable, our attempts to solve the problem with our present data are purely speculative.

It is certain that an organic lesion of the brain is the causative factor in all of the cases.

Paralysis of divergence has been reported most frequently in the infectious diseases of the central nervous system. Chambers,[19]

17. Duane, A.: Binocular Movements, Arch. Ophth. **9**:579 (April) 1933.

18. Holden, W. A.: The Ocular Manifestations of Epidemic Encephalitis, Arch. Ophth. **50**:101, 1921.

19. Chambers, E. R.: Diplopia in Encephalitis Lethargica, Brit. M. J. **1**:507 (March 14) 1925.

Bachstez,[20] Dunnington,[21] Holden,[18] Sauvineau,[22] Dor [23] and Verrey-Westphal [24] have seen it in acute epidemic encephalitis. It is of unusual interest that in the series of cases seen by Chambers in England this type of homonymous diplopia was so common as an early symptom in epidemic encephalitis that he regarded it as pathognomonic of the disease. Another interesting feature was that in many of his patients with encephalitis this type of diplopia, associated with giddiness and rise of temperature, was the only symptom complained of, and that many patients showed no other symptoms but made a rapid recovery. It was one of the earliest symptoms of encephalitis in a patient reported by Holden. In this disease the condition is probably largely overlooked and should be carefully sought for. The diplopia often disappears in the course of a few days or a few weeks. In others, it is permanent. In this connection it is of importance to mention that paralysis of convergence is readily demonstrable in many patients suffering from epidemic encephalitis, and according to Riley [25] paralysis of convergence may be considered as one of the characteristic lesions of this disease. Wilbrand and Saenger [26] stated that true paralysis of convergence is rare, but their material was collected before the large group of cases of epidemic encephalitis, in which this palsy has been found to be relatively common.

Paralysis of divergence has been reported in other acute infectious diseases. Cutler [27] observed it in acute poliomyelitis; Alger noticed it as a complication in diphtheria. Lebenson [28] reported the case of a boy 10 years old who suffered from Sydenham's chorea. In this case the diplopia disappeared in seven and one-half weeks after it was first observed. Uhthoff's patient, a boy of 12 years, had persistent homonymous diplopia for five years—the result of an acute febrile

20. Bachstez, E.: Divergence Paralysis in Epidemic Encephalitis, Wien. med. Wchnschr. **75**:2502, 1925.

21. Dunnington, J. H.: Paralysis of Divergence: With Report of Three Cases Due to Epidemic Encephalitis, Arch. Ophth. **52**:39, 1923.

22. Sauvineau, C.: Symptômes oculaires et localisations cérébrales de l'encephalite léthargique, Clin. opht. **24**:216, 1920.

23. Dor, L.: Les troubles oculaires de l'encéphalite léthargique, Clin. opht. **24**:17, 1920.

24. Verrey-Westphal, A.: De quelques symptômes oculaires dans la méso-encéphalite leth, Rev. méd. de la Suisse Rom. **40**:557, 1920.

25. Riley, H.: The Central Nervous System Control of the Ocular Movements, Arch. Ophth. **4**:640 (Nov.) 1930.

26. Wilbrand, H., and Saenger, E. A.: Die Neurologie des Auges, Munich, J. F. Bergmann, 1921, vol. 3.

27. Cutler, in discussion on Wheeler.[30]

28. Lebenson, J. E.: Paralysis of Divergence, Am. J. Ophth. **9**:684 (Sept.) 1926.

disease—complicated by a left-sided pleurisy. Zentmayer reported a case of this type and considered the cause a sequel of influenza. Four years later, however, paresis of the left superior rectus muscle developed, and the Wassermann reaction of the blood proved to be positive.

Syphilis has been the cause of paralysis of divergence in cases reported by Cutler, Bielschowsky, Sachs, Lebenson, Alger, Duane and vom Hofe. Lebenson observed some improvement in the diplopia under active antisyphilitic treatment in a patient with tabes. The paralysis, however, seems to be stationary in the chronic and more progressive syphilitic infections of the central nervous system, such as tabes and dementia paralytica.

It seems that the activity of this divergence mechanism may be directly affected by various intoxications to which the central nervous system is subject. These intoxications may be the result of exposure to heavy metals. An example is a case reported by Bielschowsky in which the patient suffered from lead poisoning. Holden has also observed it in uremia.

Of the degenerative diseases of the central nervous system, multiple sclerosis was the cause of paralysis of divergence in a patient seen by Dunphy.[29] The paralysis was unchanged during the four months of observation.

Injuries to the brain and trauma causing edema and hemorrhage must be listed as causes (Bielschowsky). In this connection, it is of interest to mention von Hippel's patient, who suffered from sunstroke; in this instance the diplopia persisted.

Diseases of the blood vessels and vascular accidents in the form of hemorrhage, thrombosis or embolism may affect the central area controlling the mechanism of divergence; such cases are reported by Wheeler[30] and Alger.

Neoplastic disease was the cause in the cases reported by Straub and by Howard.[31] Holden observed it in a tumor of the midbrain.

In the majority of cases the condition occurred without obvious cause, although from the suddenness of the development and the permanency of the symptoms it seems not unreasonable to infer that it was due to a localized hemorrhage. In these cases, the association of symptoms, together with the type of onset and collateral evidence supplied by the condition of the blood vessels in the fundus, estimation of the blood pressure and examination of the general vascular system should provide the necessary information (demonstrated in two of my own cases).

29. Dunphy, E. B.: Paralysis of Divergence, Am. J. Ophth. **11**:298 (April) 1928.

30. Wheeler, J. M.: Paralysis of Divergence, Arch. Ophth. **47**:418, 1918.

31. Howard, H. J.: Divergence Paralysis, Am. J. Ophth. **14**:736, 1931.

TREATMENT

Diplopia and subjective symptoms often disappear in the course of an acute infectious disease of the central nervous system. In such cases diplopia is possibly of toxic origin. In others, the paralysis of divergence remains a permanent feature. The patient consults the oculist for the relief of diplopia, vertigo and nausea, and because there is an apparent movement of objects which he sees. The treatment, therefore, must be largely symptomatic.

In a true muscular paralysis, the patient learns to suppress the false image or the head may be carried in such a position as to avoid diplopia, and the symptoms disappear after a certain length of time. This is true only in a certain measure in paralysis of divergence. If the paralysis is permanent, the diplopia for distance is usually permanent because the patient does not seem to learn psychic suppression very easily. If the diplopia is slight, it may be overcome by tipping the head forward, so as to direct the eyes slightly up.

Correction of the refractive error seems to aggravate the symptoms by increasing the distinctness of the double image. This is especially true in myopia. It is a curious fact that relief of the subjective symptoms (headache, vertigo, nausea and an apparent movement of objects) was not brought about by the use of a ground glass or an occlusion disk, worn over one eye. These symptoms were all aggravated by this form of treatment, especially in case 1, in which it was tried. It is possible that these patients have an interference even in monocular projection. The result of these paralytic phenomena often leads the patient toward a profound neurasthenic condition, and it becomes necessary to institute measures which will lead to a restoration of both nervous and mental balance.

It is obvious, therefore, that the treatment resolves itself into corrective measures, either by the use of prisms, placed base out over each eye, provided the degree of the deviation and the amount of diplopia are slight, or by operation, if the patient is unable to fuse images with prisms. The patient in case 1 was relieved immediately by the use of prisms, which were worn constantly in the distance correction. The patient in case 3 had worn prisms for the past twenty-five years, and it is interesting to note that there was no increase in the amount of the deviation over this period of time. Prisms are of no help if the deviation is great and (according to Duane) if there is much complicating excess of convergence. In the latter condition, prisms may tend to make the deviation progressively worse.

Operative procedures have been instituted, but in none of the cases recorded in the literature was the period of observation following the operation of sufficient duration to warrant conclusions.

Theobald, in 1886, operated on a patient with homonymous diplopia, and performed tenotomy of each internal rectus muscle. He stated that after operation there was a correction of the diplopia for distance and an establishment of binocular fixation for all distances. Uhthoff, in 1893, claimed the same results after tenotomy of one internal rectus muscle. Sachs, in 1898, gave the histories of two patients on whom operation was performed. In the first patient, the deviation measured 32 degrees for distance, and the diplopia had persisted for four months. Following an advancement operation on the external rectus muscle, the patient enjoyed binocular single vision. In the second patient, the deviation measured 24 degrees. The diplopia existed three months. The internal rectus muscle was tenotomized, and immediately after operation the patient had single vision. Three days after the operation there was a diplopia which was relieved by a 7 degree prism base out. Six days after the operation it was necessary to use a 10 degree prism base out to relieve the diplopia for distance, and a 4 degree prism base out for near vision. The patient disappeared from observation. Von Hippel's case is of interest, because after tenotomy of the internal rectus muscle in 20 degrees of deviation, there was binocular single vision in the midline, apparently for all distances, but there was also crossed diplopia for lateral gaze; in this respect the patient behaved much like one with paralytic divergent squint.

If operative procedures are to be instituted, it is difficult to understand why tenotomy of one or both internal rectus muscles should receive any consideration. It seems that the patients would be confronted with a rather serious inability to sustain convergence at the near point. It would seem much more rational to perform an advancement or a resection of both external rectus muscles in the cases in which the paralysis is stationary and the deviation so great that prismatic correction alone is of no avail. Alger advised a slight overcorrection to secure divergence in cases with a complicating excess of convergence.

CONCLUSIONS

1. Paralysis of divergence is perhaps the rarest of all conjugate palsies, but the condition is not so rare as the number of reported cases would indicate.

2. It should be looked for in all instances in which there is homonymous diplopia.

3. The diplopia field taken both for distance and for near vision is clearly differentiating.

4. The diplopia may be temporary or permanent.

5. If permanent, the diplopia for distance should be corrected with prisms placed base out to produce binocular single vision, provided the

amount of the diplopia is slight and there is no complicating excess of convergence. Prisms should not be ordered for near vision.

6. If the diplopia is too great for satisfactory prismatic correction, operative measures should be instituted, preferably a resection or advancement of both external rectus muscles.

7. Occlusion of one eye by means of a frosted glass or black disk does not seem to give satisfactory relief from headaches, vertigo, nausea and an apparent movement of objects noticed by the patient, because there may still be an interference of monocular projection.

OCULAR CHANGES ACCOMPANYING DISTURBANCES OF CALCIUM-PHOSPHORUS METABOLISM

A PRELIMINARY STUDY

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In a series of experiments on animals, the primary purpose of which was to determine the effect of a rachitogenic diet on dental caries.[1] ocular changes were noted in all the rachitic pups but in none of the normal controls. These findings suggested a relationship between rickets and the ocular lesions observed. To determine whether such a relationship did exist, and to study further the pathologic process in the eye in this dietary deficiency, we conducted a series of experiments, the results of which are described in this paper.

In the first experiment, five pups, 8 weeks old, were used. Two were fed a normal diet, and three received a rachitogenic diet for twenty-nine weeks. In the second experiment, four pups, three on a rachitogenic and one on a normal diet, were used. In the third experiment, five pups were fed a rachitogenic diet; three died of distemper and two were fed the diet for eight months.

The rachitogenic diet consisted of: oatmeal, 360 parts; skimmed milk, 50; refined cotton seed oil, 15; linseed oil, 15; sodium chloride, 12; yeast, 15, and meat, 50. In addition, each dog was given 5 cc. of tomato juice a day. Of this ration, the dogs were permitted to eat as much as they would during fifteen minutes. The diet for some of the controls consisted of the foregoing ration plus viosterol 250 D, from 5 to 15 drops per animal per day, according to age and weight. Other controls were given the regular kennel diet, which has proved protective against rickets.

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1. Blackberg, S. N., and Berke, J. D.: Effects of Ante-Natal and Post-Natal Deficiency of Vitamin D on Animal Dentition, J. Dent. Research **12**:349, 1932; Dental Caries Experimentally Produced in the Rat, ibid. **12**:609, 1932; Post-Eruptive Changes in the Permanent Dentition of Dogs Fed Rachitogenic Diets, ibid. **12**:695, 1932; Effects of Parathormone on Dentition of Rats on Normal or Deficient Diets: Preliminary Report, ibid., to be published.

The ocular changes observed in the affected animals were similar and may be conveniently described in the order of their development.

After the pups had received the rachitogenic diet for approximately six weeks, ocular changes were first noted. At this early stage of rickets the lesions observed were but slightly developed. They consisted of: prominence of the eye, with widening of the palpebral fissure; increased lacrimation; injection of the nictitating membrane, along with bulbar and palpebral conjunctival congestion; a circumcorneal ring of episcleral injection, approximately 4 mm. peripheral to the limbus, and ectasia of the cornea, with deepening of the anterior chamber. The anterior and posterior Y-sutures of the embryonic nucleus of the lens became more definite. No pathologic process of the iris or vitreous could be made out. Examination of the fundus revealed an irregularity of outline of the nerve head.

Once the foregoing lesions were noted, progressive changes developed rapidly.

About two weeks later, occasional discrete, grayish-white, small, punctate opacities were noticed involving the entire lens. There was a grayish opacity, irregular in outline, of the anterior and posterior Y-sutures.

During the following two months, the lesions became more defined. The protrusion of the cornea became progressively greater. The punctate lenticular opacities multiplied until they became very numerous and then assumed a fine, linear shape. The capsule of the lens appeared distended. The iris was swollen and slightly "muddy," with its pupillary border curving anteriorly over the distended capsule. Two animals revealed small retinal hemorrhages. There was a collection of an inspissated, creamy discharge along the margins of the lids, more marked in the region of the internal canthi. Several pups showed a loss of some cilia.

In the course of the next week, diffuse, small, glistening, orange-red spots and highly refractile, white, irregular areas of degeneration were observed over the fundus. Some changes in the color of the tapetum cellulosum were observed in several animals. A few eyes showed a seeming migration of this pigment inferiorly. Owing to the opacities of the lens, detailed examination of the fundus was difficult. Further changes in the lens occurred. The punctate opacities began to fuse, forming linear opacities. Confluence of adjacent areas gave rise to large opacities. At the same time, it seemed as if the opaque areas were anastomosing with the Y-sutures. The lens was growing more opaque, and in about six weeks, no detail of the fundus could be made out.

Besides the keratectasia, multiple, minute, punctate and slightly linear ulcers developed in the cornea. They stained with fluorescein, and chiefly involved the lower two thirds of the cornea. Many minute opacities were noticed. Corneal sensitivity seemed to be slightly diminished.

During the next seven weeks (or about six months after the diet had been started), the lenticular opacity progressed, and the suture lines became very definite. Only a hazy nerve head could be visualized through the cataractous lens. Finally, the whole lens had the appearance of a mature cataract.

Tension to the pressure of fingers was normal throughout the experimental period.

The pupillary reactions remained active, and the response to homatropine continued to be normal.

Eight weeks after the initiation of the diet, a small, white, superficial, granular, foamy area, roughly circular, 2.5 mm. in diameter, developed in the upper, outer quadrant of the left cornea of one pup. At the same time, a similar area was noticed 3 mm. above the cornea, involving the conjunctiva. The latter disappeared in a week, while the corneal lesion became less granular and grayish white. An area directly through its vertical diameter cleared first; this was followed by clearing of the granular opacity within three weeks, giving rise to a persistent nebula of the cornea.

In one animal, chemosis of the conjunctiva was observed for several days after he had been on the regimen for fifteen weeks. Hour-glass contractions of the retinal arterioles and venules were seen in a few eyes.

Another animal was studied for one-half hour before death. She had received the diet for twenty-nine weeks. There was a little inspissated secretion at both inner canthi. The globes were comparatively sunken. Episcleral injection was mild. There was a loss of corneal sensitivity. The anterior chamber was shallower than it had been. The cataract was mature. For ten minutes preceding death, there were involuntary, slow, vertical and rotatory nystagmoid movements of the globes.

Examination of the sections of the eyes, by Dr. Bernard Samuels, revealed the following: The capsule of the lens was normal in every case. Epithelial cells lining the posterior surface of the anterior part of the capsule, as well as those at the equator, showed no definite pathologic changes. The anterior lamellar layers in the center seemed to have undergone liquefaction. Each lens presented a large, well defined nucleus.

COMMENT

It is possible that the liquefied areas in the cortical substance anteriorly represented the grayish opacities noted clinically. However, in

these eyes, as in all others, it is difficult to say whether the changes were due to fixation or whether they existed in life.

In one pup, fed a rachitogenic diet for twenty-nine weeks, the ocular changes were so marked as to warrant special description here. Besides the development of lenticular opacities similar in character to those described, there appeared small gray areas in both corneas, which developed into ulcers. The ulcer in the left cornea healed, but the one in the right cornea became progressively worse, so that in about four weeks the following ophthalmologic lesions were noted:

Right Eye.—A large amount of inspissated, purulent discharge was seen at the inner canthus. The lids were slightly swollen and red, and showed a loss of some hair. They could not be approximated because of a marked anterior staphyloma, which rose 9 mm. above the level of the periphery of the cornea, taking the shape of a truncated cone, with the base extending almost to the limbus. The apex of the cone was densely white. There was increased lacrimation, with pronounced ciliary injection. The iris was swollen and had a muddy appearance. Its pupillary border was 7 mm. wide, and curved anteriorly to become adherent to the endothelium of the cornea. The lens could not be visualized, because of the existing staphyloma.

Left Eye.—At the inner canthus, there was a little inspissated, creamy discharge. Increased lacrimation was evident. Mild circumcorneal injection could be made out. In the upper, outer quadrant of the cornea, there was a small, superficial ulcer, staining with fluorescein. The lens showed a diffuse, linear, cortical opacity. There were many curved lines of white opacity, with several punctate areas scattered through them.

One week later, it was found that there apparently had been a rupture of the staphyloma, for the latter was but 4.5 mm. above the surface of the surrounding cornea. It prevented further examination. The ulcer of the left eye was healed.

Enucleation of both eyes was performed under local anesthesia, supplemented by morphine. The animal was killed immediately.

Microscopic examination showed that the central area of the cornea of the right eye had been destroyed by an ulcer. The defect was filled out by newly formed connective tissue, partially derived from the incarcerated iris. The anterior chamber contained a very albuminous fluid, and the lens showed no apparent pathologic changes. However, the absence of pathologic changes does not exclude the presence of cataract, for cataracts clinically observed may not be manifest on section. The iris was necrotic, especially at the pupillary area; elsewhere, it showed small foci of lymphocytes. The ciliary body was only lightly infiltrated. The choroid appeared to be normal. The retinal blood vessels showed

a mild perivasculitis. There was considerable round cell infiltration in the optic nerve, in the neighborhood of the cribriform fascia, anteriorly and posteriorly.

In the orbital tissues removed with the globe, there was a large area of hemorrhage undergoing organization. At another point there was a large inflammatory focus, showing muscular tissue in various stages of disintegration.

At one point in the anterior layers of the cornea of the left eye near the limbus, there was a slight cellular infiltration. No other active inflammation was seen.

The lacrimal gland showed considerable diffuse, lymphocytic infiltration.

The diagnoses were as follows: In the right eye—(1) perforating ulcer of the cornea, (2) iridocyclitis with some necrosis of the iris, (3) neuritis, and (4) orbital cellulitis; in the left eye—(1) keratitis and (2) dacryo-adenitis. The corneas of these affected eyes contained an increased number of "corneal corpuscles" of fibroblastic origin.

CONCLUSIONS

It has previously been shown that a disturbance in the calcium-phosphorus metabolism is often accompanied by dental caries and other abnormalities.[1]

Our animals with a disturbed calcium-phosphorus metabolism showed marked dental decay, as well as ophthalmologic changes. Since clinically, conical cornea is also often associated with dental pathologic processes, the same etiologic factor, a disturbance of the calcium-phosphorus metabolism, may operate in man.

Mr. E. Burchell prepared the microscopic slides, and Dr. Bernard Samuels examined them.

POPULAR MEDIEVAL OPHTHALMOLOGY

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Just as the nineteenth century was closing, J. B. Patella reviewed in *Janus* (*Archives internationales pour l'histoire de la médecine et la géographie médicale*), then in the second year of its career (1897-1898), a little book on the diseases of the eye which is one of the landmarks in the history of ophthalmology. The contents of that volume are rather well known to ophthalmologists generally, and it is surprising to find how much more the physicians of that time knew about diseases of the eye than is generally realized. For instance, the author attributed cross-eye to an abnormality of the ocular muscles but said that this muscular abnormality was often due to a disturbance of the nervous system. In some cases the muscles alone were at fault, while in others the nerves were responsible. Evidently he knew something about strabismus and ophthalmoplegia.

The author of this little book was Peter of Spain (Petrus Hispanus), a well known physician who was for a time physician to the pope and was afterward himself made pope under the name of John XXI. He conducted his medical studies mainly in Paris, though it is said that he was in Montpellier for a time. When about 35 years of age, he received an invitation to the chair of "physic," as medicine was then called, at the University of Sienna. His book on ocular diseases is an index of the practical nature of his instruction. It shows, above all, that clinical observation held a large place in his method of teaching. During his time as professor of medicine at Sienna, this Italian town passed the first law that is known of for the regulation of public health. He was one of the great pioneers in the science of sanitation and took with him to Rome, when he became physician to the pope, the idea of applying sanitary principles to the preservation of health in that city, then one of the largest in the world.

Usually this little book by Peter of Spain is considered to be one of the earliest contributions to the modern literature on ocular diseases. Peter himself, however, confessed that he borrowed some of his remedies and some of his knowledge of the diseases from the school of Salerno, that southern Italian town not far from Naples which had the earliest medical school of modern times (eleventh century), around which there came into existence the first modern university. Peter acknowledged his indebtedness also to Benvenutus Grapheus of Jerusa-

lem, whose book entitled "Ars probata de aegritudinibus oculorum" ("The Tested Art of Diseases of the Eye") was one of the best known treatises on ocular diseases in the twelfth century.

Besides these books there is a study of diseases of the eyes published just before the middle of the thirteenth century which is of great interest because it displays so much more knowledge of these diseases than is thought to have existed at that time. Curiously, this little work—a series of chapters in an encyclopedia—was written not by a physician but by an encyclopedist whose desire was to convey information in such a form that it would be comprehensible to nonmedical minds and readily available for those seeking detailed knowledge with regard to all sorts of subjects.

The writer was Bartholomæus Anglicus (he is known by the Latin form of his name, for at that time every one wrote in Latin; the name is translated Bartholomew the Englishman). He was a Franciscan who wrote a popular encyclopedia under the title "De proprietatibus rerum" ("The Properties of Things"). In this he compiled the information available on all subjects at that time. His brother Franciscans wandered around Europe (this was not long after the death of St. Francis) and were consulted by the priests and the laity on all sorts of subjects. Bartholomew wrote his encyclopedia to enable them to have information available.

Whether he wrote all of the chapters in the book himself is uncertain. Editors of encyclopedias often ask authorities on certain subjects to write the articles on those subjects. There must have been a number of young men among the Franciscans of that day who for a time had studied medicine, and Bartholomew may have turned to one of them, or even to several of them, in order to be sure that his information was up to date and reasonably accurate. Bartholomew is thought to have been at Oxford for a time. He was surely in Paris for four or five years as a professor in the university, and it was in Paris that, with a group of professors, he joined the Franciscans. He taught at the University of Cologne for several years. He had, therefore, a rather wide knowledge of the scholarship of Europe of that day and was well fitted to gather information in the way that he did.

Bartholomew's work was one of the most read books during the later part of the middle ages. There is said to be a larger number of manuscript copies of it than of any other book except the Bible, and even before the introduction of printing it was translated from the original Latin into four of the vernacular languages. It was one of the early secular books to be printed. The *editio princeps* was issued in 1472 from the press of Caxton in Cologne, where the Englishman was learning the art of printing. About twenty editions were published before 1501; so the book has a very special place among the incunabula of

printing. It is surprising how many subjects are treated in a fashion very similar to their modern presentation. This is particularly true with regard to the medical topics, especially mental diseases.

His series of paragraphs (*capitula*) with regard to diseases of the eyes, which I quote here, must speak for themselves. I have submitted them to some well known ophthalmologists, who feel that the work represents a knowledge of ocular diseases very remarkable for that time, and that it indicates that careful observations had been made and that a broad and firm foundation of the knowledge of these diseases was thus laid seven centuries ago.[1]

AFFECTIONS OF THE EYES, ESPECIALLY PAIN

Ache and smarting of the eyes comes sometimes from outward causes as of wounds that divide or injure the continuance of the tissues of the eyes or from powder [dust or granular matter] that hurts the eye and particularly the tender substance of it [the cornea] or from smoke that dims the eyes by causing them to water and makes them smart. It may come from cold wind smiting [affecting] the spirit of light [the power of vision]. Affections of the eye may also come from hot air that has a tendency to dissolve and divide tissues by drying them or from too great brightness of the sun or of some other bright thing which disturbs the spirit, that is the power, of sight . . . . This may lessen the power of vision. Continual drunkenness may dim the sight as well as over eating, so also may the too frequent service of Venus which corrupts and dissolves the general vitality and dims the crystalline humors.

Sometimes the causes are internal and are due to the humors of the body, hot or cold, dry or moist. [Almost to the present time the theory of a pathologic condition of the humors continued to provide the explanation of the origin of many diseases, and in Germany at least this conception is coming back to a noteworthy extent.] The first and chief ache and smarting of the eyes comes from within the body and is an acute ulcer or aposthume [small abscess] which is bred upon the white of the eye. This is due to humors that flow toward the black of the eye [the pupil] with the production of a definite lesion . . . . [the development of this] is due to feebleness of the eye which comes over it and in many cases from acute irritation [sharp biting] that may make itself felt also in the brain. [Bartholomew seems to have realized the intimate relations between the brain and the eye and the effects of meningitis as noticed in the eye.]

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1. I have tried to follow as closely as possible the text of the English translation published by Wynkyn de Worde just after the discovery of America. This text probably represents not only what Bartholomew said but to a considerable extent what the people of the end of the fifteenth century thought with regard to diseases of the eyes, for the translation from the Latin is not very literal and manifestly those who prepared it tried to reconcile Latin expressions of the middle of the thirteenth century with the ideas of ocular diseases which they possessed about two hundred and fifty years later. To be really understood, Bartholomew's paragraphs on diseases of the eyes ought to be read in conjunction with what he says of other conditions, for it is rather surprising to find that diseases like dropsy, jaundice, infestation by intestinal parasites, frenzy (under which he includes delirium tremens), catarrh of various kinds, epilepsy and other familiar maladies had been rather carefully studied and remedies for them suggested, not a few of which represented physical therapy of various kinds.

When there is an ulcer of this kind the eye swells and becomes watery and red and feels pain and heat and even burning. These symptoms may come from a bilious fever [cholera]. In these cases the eye feels as if pricked with needles. If a cold humor [this is the equivalent of the popular medical expression "catching a cold"] is the cause or an affection due to exposure to the wind the eye is halyd (suffused) and is painful at night and the lids are stuck together [conjunctivitis]. Many humors are disturbed and painful and phlegmatic conditions develop.

If blood is the cause then there is great itching, many tears and a good deal of heat in the development of the affection. Light pricking feelings with achiness from swelling and smarting mostly in the forehead are also present. [The acute conjunctivitis due to infection Bartholomew attributes to an internal disturbance of the humors.]

If this disease comes from outward things the patient must be brought to rest and sleep with his head reared on high for the sake of the running of the tears. He must avoid shining things and the brightness of light so as to avoid the relaxation and disturbance of tissue due to light. He shall not speak lest there be great relaxation of the brain by a forcing of the voice. He must be given cold food light of digestion lest the flowing of the rheum [mucus] should increase. He must drink clear hot water for it neutralizes the wasting of the tissues by the nature of its own vapor and it soothes the sinews [nerves] and assuages burning and pricking. The patients shall use baths of fresh water and if this is done there need be no other medicine.

And if the ache comes of inner humors the humor that the defect is in shall be purged or withdrawn by blood letting or by suitable purgation of medicine. [If the blood was considered to be at fault enough of it was taken away to lessen the amount of the pathologic element present. If bile or black bile was supposed to be the cause, purging of the intestinal tract was employed.]

After a time binding medicines [carminatives] should be given as Constantine says, and healing should be brought about by applications of water of roses or woman's milk. [Babies' urine had been used much earlier because it did not cause the irritation of the osmotic processes that is excited by water alone. All through Bartholomew's work woman's milk is mentioned instead of babies' urine. It was used much for external applications.]

The tears may be stinted [stopped] by restrictory [astringent] or arresting application. At the beginning of the affection light repercussives should be applied with assuaging medicines internally and as the disease advances mainly dissolvent medicines and in the end consumptive remedies [those that lessen swelling] and always with these comfortatives [strengtheners] should be used.[2]

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2. The physicians of that day had a number of medicines, mainly obtained from herbs, to which they attributed special effects. They classified drugs in much the same way as the generation before the present one did. In a copy of Potter's "Handbook of Materia Medica, Pharmacy and Therapeutics" (1902), I find medicines listed according to their generic effects—"alteratives, analgesics, anaphrodisiacs, anhydrotics, antagonists, antiphlogistics, antiperiodics, antidemotics, carminatives, depressants, diaphoretics, dissolvents, diuretics, emetics, expectorants, galactagogues, hepatic depressants and stimulants, hypnotics, astringents," and so on through a long list. There was apparently almost as long a list before the middle of the thirteenth century.

Around an ulcer of the eye materiatives [substances containing material particles] must never be put lest the tender substance of the eyes [the cornea] be destroyed. If drops come out [if pus is present] or if the first application to the eye is soon hot no strong percussives should be applied, for the matter might suddenly be smitten to the sinew [nerve] of the optical cavity and from stopping [disturbance or inhibition] might come blindness forever more. [Bartholomew had evidently learned the lesson that much more harm than good was likely to be done to the eye by meddlesome therapeutics and was warning people of the danger of remedial applications.]

Bleariness of the eyes is due to clammy and gluey secretions of the eyes [superfluities] cleaving to the lids. This is caused by phlegmatic or melancholic humors and begins in the corners of the eyes and causes the eyelids to swell and interferes with their function. This destroys the hair of the lids and makes the eyelids, as it were, pieces of raw flesh [blepharitis]. In blear eyes the pupil is whole and sound but the humor is disturbed and the eyelids become swollen. Frequent washing of the eye causes it to get better.

LIPPITUDE, ALBUGO, PANNUS AND MACULA

Another disease of the eye that we call a web, Constantine called albugo or pannus. It develops in this way: first a rheum [catarrh] runs to the eyes and produces a disease called ophthalmia which is a shrewd [acute] bleariness followed by an ache and a tendency to the formation of an ulcer. If the disease that results abides [becomes chronic] more infection develops and after a long period this turns and grows into a web that is quite thick. This may occupy more place than the size of the pupil. As the web becomes thicker and takes up more room it covers all the pupil of the eye. After a while it comes to look like a fingernail it is so thick and hard and it becomes incurable if it is chronic. It must be dealt with and considered according to the place in which it is. If it is above the crystalline humor during half a year it is incurable and in the beginning it can be only with difficulty helped. If it is bound under the kertle [covering] of the eye that is called conjunctiva or above it during ten years, nothing can be done for it. When this mole [granulation] is fresh and small, red poppy seed, as Constantine says, suffices to help it. Red poppy seed is hot in the first degree and dry in the second degree and therefore it has the power to make thin and to bring about absorption and to destroy the condition.

Philosophers tell, according to Constantine, that the blood drawn out of the right wing of a colver [dove or pigeon] or of a swallow or of a snipe applied in the beginning upon the mole [this word was used for any abnormal mass of tissue, small or large] has a powerful action upon it, for the blood of these birds has a heating and strong dissolving action according to the nature of the bird from which it comes.[3]

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3. Probably the most surprising feature of Bartholomew's discussion of ocular diseases is this description of trachoma. There was an old tradition that the disease was contracted by Napoleon's soldiers in Egypt, hence the name Egyptian ophthalmia. It was supposed to have been brought back to Marseilles and thence disseminated in France and later over the rest of Europe. De Schweinitz corrected this false notion, and Stevenson had previously pointed out that trachoma had been in existence for some centuries at least in modern Europe. Bartholomew seven centuries ago described the pathologic picture of the disease in such detail that it is clear that the condition must have been rather common and quite well known at that time.

EYE DISEASE THROUGH BLOOD CLOT [SUBCONJUNCTIVAL HEMORRHAGE]

The eyes have another disease which disturbs them that is due to infection [a disturbance] in the blood. Constantine calls it blood clot [bloodshot eyes]. It results when blood by any chance gets into the eyes and is dry as a crust. It develops if the blood oozes out of the veins and of the pipes [the arteries] and finds its way to the eyes. Some veins rupture or are injured in the covering that is called the conjunctiva and then the eye disturbance is due to the blood that finds its way into the eye. Pigeon blood or turtle blood [this is not the first mention of turtle blood in therapeutics, and turtle serum attracted a great deal of attention as a remedy for tuberculosis thirty years ago] dissolves this blood that is so clotted. Constantine says that woman's milk with incense or fresh cheese meddled with honey without salt if applied will also bring about the resolution of the clot of blood. Constantine mentions many other experiments and assays for the treatment of this affection.

INVOLUNTARY TEARS [CHRONIC DACRYOCYSTITIS]

Involuntary running of tears happens in the eyes sometimes from an external cause, as a blow, but it may occur from the effect of hot air or of cold air or from irritation by smoke or disturbance due to powder or from the smelling of the strong odor of onions and garlic. Sometimes the tears are due to internal causes as of hot or cold humors or from excessive humors that find their way out because of lack of room to abide in them. They may come from inability of the brain to hold them [as in hysterical conditions or the like] or they may be due to virtue of outputting [overabundant secretion].

If hot humors are the cause of them the eyes are red and tears that drop [run down the cheeks] burn the face and hot applications add to the discomfort while cold helps. If the humors are cold the eyes are pale and the tears are cold and bite not the face. Cold things add to discomfort and heat helps if the tears come from outward cause. The chief remedy is clean pure wax and powder of cummin seed heated and oft plastered [applied] for it does away with the ache and the tears and wens. If the condition is due to a wound the best help is in surgery.

When due to other outward causes relief is afforded by warm water, provided the water is not too warm [lukewarm].

If the affection comes from running and over-abundance of humors, then the patient must be purged. For this cinnamon with wine-soda [the tartrates that collect in wine casks] with frankincense is the principal treatment. Wrapping a bandage about the temples and the forehead may restrain the tears. This helps against the running of tears whether they come of hot causes or of cold.

DEFECTIVE VISION

Defective sight in the eyes happens from many different causes. Sometimes it is the result of a delicate constitution, sometimes corruption consequent upon vapors which find their way out of the stomach, sometimes from the stopping [interfering with the function] of the sinew that is called the optic nerve, the hollow sinew [as if the author knew something of the distribution of the optic nerve over the back of the eyeball]. It may be due to [interference with sight] of webs or moles [fleshy masses] and of wens and other like causes. Sometimes defective vision is due to inordinate diet and develops sometimes from long sickness and fasting. It may come as a consequence of the service of Venus.

[Nothing definite was known about syphilis at this time, but it was in existence in Europe and the observation may have been made that men given to indulgence of this kind went blind oftener than others.] It may be due to many other causes as age and other things.

Then the causes shall be distinguished alone by their own signs and tokens, for if the fault is with vapors arising from the stomach [processes of indigestion] the defect of sight is not continuous but comes and goes and waxes and wanes with diversity of food and drink.

If the defective vision is due to a defect of the brain [certain tumors interfere with vision] the sight is the same before food and after. If the disturbed vision is due to some affection of the optic nerve, then the substance of the eye is pure, bright and clear. External symptoms and tokens can easily be seen. To improve this defective vision if it comes from diseased humors, the stomach should be cleansed and purged [the intestinal tract should be thoroughly cleaned out] for this will cleanse all the body and especially the head. Beyond this remedies should be employed as occasions require. These remedies may be found in Constantine's Viaticum and in other authors.

PRIVATION OF VISION [BLINDNESS]

Blindness is privation of sight. When a man is bereft of his sight sometimes it is due to something the matter with the rest of his body and sometimes from disturbances of the pupil not admitting the spirit of sight. For sight to be in good condition the vitality must be good.

Blindness is sometimes due to stopping of the inner sinew, the sinew that is called the optical nerve [that is, interference with function]. This nerve bears and brings to the eye the spirit of sight and if that sinew is stopped [interfered with] at its beginning or in the middle with over-growing of flesh [tumor formation] or with superfluity of some clammy humor [increase of pressure in the fluids of the body] then the virtue of the sight finds no passage that will enable it to get to the black of the eye [the pupil] and so blindness is bred in the eye.

Sometimes blindness comes from consumption [any form of wasting disease] or the drying up of the humors [fluids of the body] or of the spirits [vitality] as happens in old men. First their eyes wax dim and then they have defective sight and at last the virtue of sight fails and they lose all their sight [cataract].

Sometimes blindness comes from some external cause as a wound of the eye, or from excessive and continual weeping, and from dissolving of the substance. It may also come from thickness of the humors of the eye for then the black of the eye [the pupil] by sudden sweating and oozing of substantial humor into the pupil, as occurs particularly in men that take drenches [baths] and are let blood, may be blocked [optic neuritis], for there is sometimes peril of blindness from too great bleeding [puerperal hemorrhage]. Sometimes it may be due to sudden shedding of the spirit of sight [thrombosis of the central vein or embolism of the central artery] with drying up of the substantial moisture of the eye. This happens in a bear that is suddenly made blind with beholding and looking on a bright burning [shining] basin [which acts as a concave mirror in focusing light]. The cause of the blindness is the beholding of the very bright light. The power of the basin destroys and wastes the kertle [conjunctiva] of the eye and disturbs the crystalline humor. The brightness is disproportionate to the spirit of sight [as if the pupil were not prepared to modify it proportionately by contraction] and so blindness ensues. [Whenever there is total eclipse of the sun people are warned of looking at the brightness of the sun as it comes out from the shadow because of the danger to sight.]

Among all the diseases and affections of the wits [mind] and of feeling [sensation] blindness is most wretched. This is Constantine's opinion, for without any bond blindness is a real prison, for blindness beguiles the force of the imagination in knowing things. For what a seeing person may deem white, a blind man thinks black, and contrariwise. It hinders the power of judgment and consideration, for the blind man, wishing and planning to go eastward, is beguiled in his dome [in his head] and goes westward. And blindness overturns the power of affection and desire. For if men proffer a blind man a silver penny and a copper so that he may choose the one that is worth more, while he wishes to choose the silver penny he often chooses the copper. The blind man's wretchedness is so great that it makes him subject not only to a child or to a servant for ruling and guidance but also to a dog and the blind is often brought to such great need that in order to pass and escape the peril of a bridge or of a ford he is compelled to trust in a hound more than himself. Also where all men doubt and dread he sees no peril and the blind man feels secure, and in like manner where there is no peril a blind man dreads the most. He trips often on a level road and stumbles. Often where he should lift up his foot he bends it downward and likewise where he should set his foot to the ground he lifts it upward. He lets his hound go on ahead of him and gropes and grasps himself. He looks all around for the road with his hound and his staff. Seldom does he do aught with a sense of security. Well nigh always he doubts and dreads.

The blind sometimes lift up their eyes toward heaven but the brightness of heaven comforts not their eyes. The sun beam is present for the blinded eye but the blind man knoweth not the strength and the virtue [power] of the sun.

Sometimes the blind man hits and hurts the child that leadeth him but he soon repents the beating because of what the child will do to him, for the child remembers the beating and forsakes the blind man and leaves him alone in the middle of a bridge [country bridges had no rails] or in some other peril and does not direct him in the way to avoid the peril.

Because of his condition the blind man is wretched, for within the house he dare do nothing with confidence and on the road he dreads lest his fellows forsake him. The condition of seeing men is ever so much better than the condition of the blind. And yet eyes may be enemies and thieves and rob men of their wits. While we follow the desire of the eyes we are made subject to right cruel enemies. As the commentator on Scriptures says: "Mine eyes hath spoiled and robbed my soul." Better it is for a man to be blind and have his eyes put out than to have eyes and be deceived and beguiled with pleasures and flattery. As Gregory says, commenting on the expression of the commentator, better it is to go without eyes into life than to have eyes and be spilt [cast] into fire without end, as says Matthew, chapter vi.

OCULAR COMPLICATIONS OF ERYSIPELAS

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Erysipelas is of interest to the ophthalmologist because the eyes and adnexa are frequently involved in it. In 130 cases of facial erysipelas observed at the Cook County Hospital in the first six months of 1933, the eyes or adnexa were involved in 103 cases, or approximately 80 per cent. The accompanying table shows the complications in these cases.

Complications in Cases of Facial Erysipelas

Total number of cases of facial erysipelas		130
Erysipelas of the lid		103
Superficial abscesses of the lid		7
Corneal ulcers		3
Orbital cellulitis		6
Bilateral	2	
Unilateral	4	
Blindness		3
Bilateral	2	
Unilateral	1	
Deaths (total)		13
Orbital cellulitis	1	
Pneumonia	6	
Cardiac disease	3	
Sepsis	1	
Uremia	1	
Undetermined	1	

According to Magnus,[1] of 2,528 cases of blindness due to all causes in Germany, 0.079 per cent followed erysipelas, and according to Oppenheimer[2] this disease was the cause in 0.8 per cent of 572 cases of blindness in the United States. Knapp[3] reported on 37 cases of erysipelas in which sight was lost. An excellent presentation of the relation of this disease to the eye was given by Groenouw[4] in 1904.

The erysipelatous exanthem most frequently appears in the region of the eye. Lenhartz[5] gave as the sites of predilection the lids, inner

From the Cook County Hospital and the Department of Ophthalmology, Northwestern University.

1. Magnus, H.: Die Blindheit, ihre Entstehung und ihre Verhütung, Breslau, J. U. Kern, 1883.

2. Oppenheimer: Tr. Am. Ophth. Soc. **6**:156, 1891.

3. Knapp, H.: Arch. Ophth. **13**:83, 1884.

4. Groenouw, in Graefe-Saemisch: Handbuch der gesamten Augenheilkunde, ed. 2, Leipzig, Wilhelm Engelmann, 1904, vol. 11, p. 571.

5. Lenhartz, in Nothnagel, C. W. H.: Specielle Pathologie und Therapie, Vienna, A. Hölder, 1899, vol. 3.

canthi, cheeks and bridge of the nose. Ker [6] stated that the inner canthi and the margin of the nares are the most frequent locations for the onset of the inflammation. In many cases in which the lesion first presents itself externally at the inner canthus, the inflammation reaches the eye from infection in the nasopharynx through the nasolacrimal duct.

The exanthem is shiny, red, tense and raised. The borders are sharply defined. The inflammation attains its greatest severity within two or three days, and then gradually subsides in the area first involved. Since the skin of the lids is lax, there is slight resistance to the outpouring of a profuse serous exudate. This extreme swelling of the lids closes the palpebral fissure.

In the more severe cases, vesicles form on the surface, which may progress to suppuration with the formation of superficial necrotic abscesses, as in 7 of the cases at Cook County Hospital. Gangrene of the lids with loss of tissue has been reported by Carmi,[7] Pilcher [8] and others. In such cases healing produces ectropion. Because of incomplete closure of the lids, suppuration of the cornea from exposure may ensue and produce visual impairment long after the subsidence of the acute inflammation.

As a result of stagnation of secretions, or because the inflammation extends to the lining membrane of the eye, conjunctivitis during erysipelas of the lids is common. Cousserant [9] observed a case of erysipelas in which a bullous keratitis developed. Waldstein [10] reported corneal involvement in erysipelas of the lid. In his case blebs and vesicles developed on the cornea, from which a pure culture of streptococci was recovered. Keratitis occurred in 3 of the cases at the Cook County Hospital. In 1, because the cornea was entirely destroyed, evisceration was necessary. In the remaining 2 cases, dense scars formed.

Keratitis neuroparalytica from paralysis of the fifth nerve has been reported in cases of erysipelas. In Pilcher's case there occurred, on the side of the exanthem, atrophy of the optic nerve, paralysis of the first and second branches of the trigeminus nerve and palsy of the facial nerve. Inflammation of the lacrimal gland in the course of this disease is described by Stock.[11]

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6. Ker, C. B.: Infectious Diseases, New York, Oxford University Press, 1929.

7. Carmi, A.: Cong. d. Soc. ital. d'oftal., 1930, abstr., Zentralbl. f. d. ges. Ophth. **26**:629 (March 15) 1932.

8. Pilcher, A.: Klin. Monatsbl. f. Augenh. **61**:653, 1918.

9. Cousserant, quoted by Story, J. B., in Norris, W. F., and Oliver, C. A.: System of Diseases of the Eye, Philadelphia, J. B. Lippincott Company, 1900, vol. 4, p. 687.

10. Waldstein: Ztschr. f. Augenh. **23**:354, 1900.

11. Stock, in Graefe-Saemisch: Handbuch der gesamten Augenheilkunde, ed. 2, Berlin, Julius Springer, 1925, vol. 9, pts. 3 and 4, p. 40.

There is hardly a disease that has a greater tendency to recurrence than erysipelas. For this reason, the eye may be involved in a subsequent inflammation, if it is missed in the first attack. Recurrent attacks cause permanent thickening of the skin of the lids, producing elephantiasis, or a condition resembling blepharochalasis, as in the cases reported by Camison [12] and Weidler.[13]

Rarely, metastatic involvement of the eye has been reported in erysipelas, producing abscess of the vitreous, suppurative chorioretinitis and iridocyclitis.

Orbital phlegmon, with its sequelae of involvement of the nerve or brain, is far more frequent than one is led to believe from the accounts given in the textbooks. In the sections on erysipelas in Tice's "Practice of Medicine" and Ker's "Infectious Diseases," this serious complication is not mentioned, while other books scarcely allude to it.

Groenouw reported 53 cases of orbital cellulitis following erysipelas, and quoted Schwendt's 44 cases of orbital phlegmon, of which 13 were due to this disease. Knapp stated that whenever visual impairment occurs in erysipelas, orbital cellulitis is the anatomic cause. Inflammatory processes in the skin of the lids is a cause of retrobulbar inflammation more frequently than one gathers from the literature, according to Mylius.[14] Orbital phlegmon, Leber [15] believed, is not seldom the chief manifestation of a suppressed or a fleeting facial erysipelas. There were 6 cases of severe orbital disease in the series at the Cook County Hospital.

The ease with which the erysipelatous inflammation extends from the lid to the orbital tissues is easily understood from a study of the numerous anastomoses of the orbital veins with the neighboring vessels. That the retrobulbar inflammation may arise from the nasal accessory sinuses during the course of erysipelas is possible, but when orbital disease arises from sinusitis, evidence of suppuration in the nose is usually present.

The chief anatomic finding in most if not in all cases of orbital cellulitis is a thrombophlebitis. In thrombophlebitis, the inflammatory process is scattered, forming minute, dispersed areas of infiltration, mainly in the region of the veins. By confluence of these miliary lesions, a huge abscess may form.

Infiltration of the external ocular muscles and the third, fourth and sixth cranial nerves is a frequent anatomic finding. These factors, along with the mechanical difficulty produced by the swelling, explain the immobility of the eyeball during this disease.

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12. Camison: Abstr., Zentralbl. f. d. ges. Ophth. **16**:830, 1926.
13. Weidler, W. B.: Arch. Ophth. **51**:505, 1922.
14. Mylius, K.: Ztschr. f. Augenh. **56**:302, 1925.
15. Leber: Arch. f. Ophth. **26**:212, 1880.

In experimentally produced orbital cellulitis in dogs, Otschapowsky found that the inflammation extended from the orbital tissues to the optic nerve. This is a condition found frequently in man, according to Birch-Hirschfeld.[16] This, he believed, causes a gradual disturbance of vision, whereas circulatory disturbances cause a rapid loss of sight. The conclusion drawn by Knapp is that compression producing venous thrombosis is the important factor in the production of blindness. Bartels[17] considered acute inflammatory edema of the optic nerve as the cause of the sudden and complete loss of vision in erysipelas.

Intracranial complications arise as a result of extension by means of the venous route. Less often the infection propagates itself along the nerve sheaths or through the superior orbital fissure to the brain and the meninges.

Exactly when, in the course of erysipelas of the lids, the retrobulbar inflammation begins is difficult to determine. Groenouw stated that extension to the orbit rarely takes place before the second or fourth day. The patient and his physician often are unaware of this complication and discover it only when, on the subsidence of the swelling of the lid, the eye is found to be blind.

Proptosis is a constant symptom, sometimes reaching an extreme grade. Immobility of the eyeball and chemosis are seldom absent. Visual acuity may remain intact, but more often is impaired.

The sight is often lost rapidly and early, as in Leber's case in which vision was good in the morning while on examination in the evening of the same day it was totally absent. In 3 cases at the Cook County Hospital, at the first examination, made during the first few days of the disease, vision was entirely absent in one or both eyes. In other cases, the impairment in vision takes place gradually. Days, weeks and even months pass before the maximum loss is reached. McCullock[18] reported a case in which optic neuritis with loss of vision appeared four months after an erysipelatous orbital phlegmon.

The orbital infection reaches its peak within from five to seven days, but it takes weeks or months for the proptosis to subside completely. Those cases in which the exophthalmos persists for only a few days are probably due to edema rather than to inflammation of the orbital tissues.

The disease is often bilateral. The lids and orbits of both eyes are usually involved at the same time. Groenouw quoted Schwendt as pointing out the importance of the time element in the diagnosis and prognosis. If proptosis develops in the second eye several days after that

16. Birch-Hirschfeld, in Graefe-Saemisch: Handbuch der gesamten Augenheilkunde, ed. 2, Leipzig, Wilhelm Engelmann, 1907, vol. 9, p. 376.

17. Bartels: Arch. f. Augenh. **56**:267, 1907.

18. McCullock: Tr. Ophth. Soc. U. Kingdom **43**:671, 1923.

in the first eye, the route of infection is through the cavernous sinus. In these cases signs of intracranial disease, such as headache, vomiting and stiff neck, may already be present, and death occurs within a few days.

Ophthalmoscopic examinations early in the course of the disease are not frequently undertaken. The swelling of the lids or corneal involvement often prevents inspection. Birch-Hirschfeld stated that serious impairment of vision can occur with little or no changes in the fundus. On the other hand, inflammatory changes in the optic disk, such as venous hyperemia and even optic neuritis and choked disk without visual disturbances, are often observed. In the cases of Phronimos,[19] Wissmann [20] and Junius [21] and in those at the Cook County Hospital there was optic neuritis with or without retinal changes. Later, pallor of the disk with markedly narrowed vessels resembling mere white threads is seen.

The prognosis of orbital cellulitis of erysipelatous origin is grave both as to sight and as to life. Groenouw quoted a 25 per cent mortality in Schwendt's collection of cases and 23 per cent in his own. There were 10 deaths in Knapp's series of 35 cases, and 1 fatality in the 6 cases at the Cook County Hospital. Death is caused by cavernous sinus thrombosis, meningitis, pneumonia, pyemia and pulmonary embolus. Sight was recovered partly or completely in 4 of Groenouw's 14 unilateral cases. Four of the patients recovered vision in one eye and 5 recovered vision in both eyes in 14 bilateral cases. Of Knapp's 25 surviving patients 4 were blind in both eyes and 15 in one eye, while 3 recovered vision partially and 3 completely. In the series at the Cook County Hospital there were 1 unilateral case and 2 bilateral cases in which vision was completely lost. In 2 unilateral cases, vision was unimpaired at the time of the patient's discharge from the hospital.

TREATMENT

During the course of erysipelas of the lid, separation of the swollen lids will permit an early recognition of orbital cellulitis. Protection of the cornea is important. Superficial abscesses of the lid are incised and drained. Rønne [22] expressed the belief that this procedure, if carried out early, will prevent or abort severe orbital cellulitis.

Since the inflammation is of a diffuse nature and macroscopic pus is not present early, search for a deep abscess is futile. However, when an orbital abscess is present, incision or exploration is essential. If pus

19. Phronimos: Arch. d'opht. **32**:161, 1912.

20. Wissmann, R.: Klin. Monatsbl. f. Augenh. **52**:611, 1910.

21. Junius: Ztschr. f. Augenh. **42**:1, 1919.

22. Rønne, H.: Diagnosis of Inflammatory Exophthalmos, Ugesk. f. læger **87**:841, 1925; abstr., J. A. M. A. **85**:1768 (Nov. 28) 1925.

is not found and intracranial complications are impending, evisceration of the orbit, though a seemingly radical procedure, is often a life-saving measure. Thus, in a case of orbital cellulitis of nonerysipelatous origin, recently seen, no pus was found on exploration of the orbit. Because signs of meningeal irritation appeared, evisceration of the orbit was performed by Dr. S. R. Gifford. The orbital tissues were matted together and of meaty consistency. Thrombophlebitis of the orbital veins and a small abscess in the center of the muscle cone were found. An uneventful recovery followed.

CONCLUSIONS

1. Erysipelas of the face is in most instances a disease of the lids.
2. Orbital cellulitis is not an infrequent complication and may be the chief manifestation of erysipelas.
3. Loss of vision in this disease is due to orbital cellulitis or corneal involvement, rarely to a metastatic iridocyclitis or abscess of the vitreous.

Clinical Notes

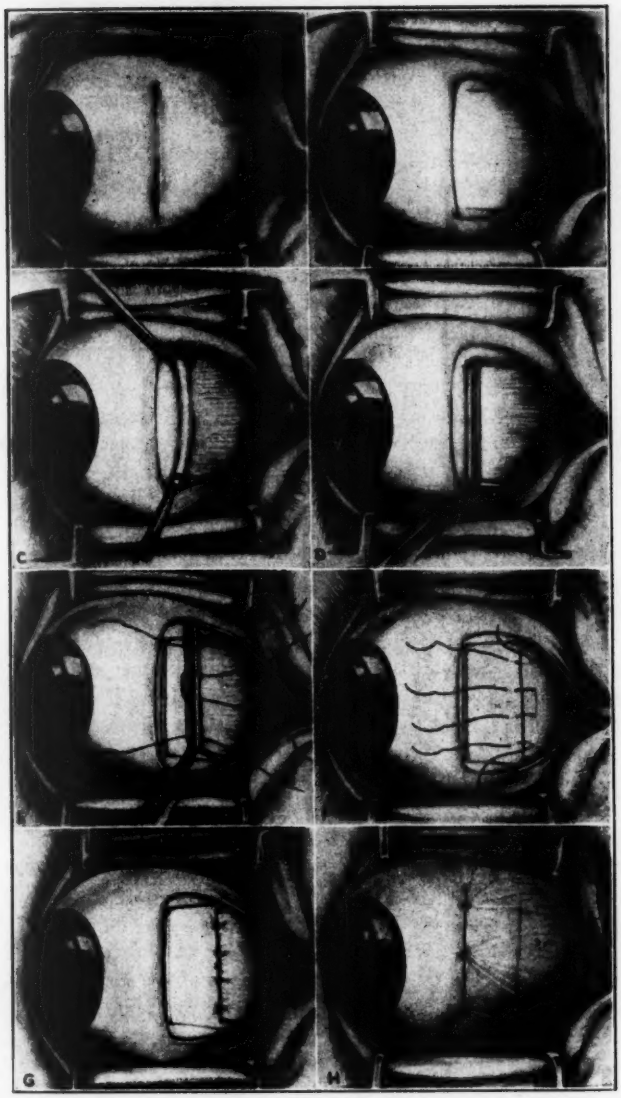
MODIFICATION OF JAMESON RECESSION OPERATION FOR STRABISMUS

FREDERICK ALLISON DAVIS, M.D., MADISON, WIS.

During the past three years I have used the Jameson recession operation both alone, as an "entity," and in conjunction with the Reese resection, and on the whole my results have been much more satisfactory than with the older procedure of resection and tenotomy. I have found it difficult in some respects to carry out the exact technic outlined by Jameson. I refer particularly to the site of incision of the conjunctiva, when recession of the internal rectus muscle is performed. Jameson usually places this incision at the border of the semilunar fold of the plica, 5 mm. back of the insertion of the tendon, when the internal rectus muscle is to be retroplaced this distance. A cleancut incision at this point is difficult, first, on account of the semilunar fold, and, second, because the space at this point is restricted owing to the narrowing caused by the curve of the lids as they merge at the inner canthus. This is especially true when the palpebral fissure is narrow, and also when the cooperation of the patient is poor. Further, bleeding may be more annoying owing to increased vascularity at this point. I have likewise encountered some difficulty in dissecting the delicate conjunctiva forward to the insertion of the tendon, for this is likely to be frayed unless extreme caution is taken to prevent it. It is difficult to decide on the exact position to which the muscle is to be receded before the underlying tendon and muscle have been exposed and thoroughly inspected. Jameson emphasizes the importance of this point, and yet if the conjunctival incision is made as a routine measure in the position he advocates, it may not coincide with the exact point on the sclera to which the muscle is finally reattached, and, therefore, it may be out of line with the conjunctival incision. I have, therefore, been making the conjunctival incision directly over the insertion of the tendon. Ample space is afforded here to make a very free incision (from 12 to 13 mm. long) well beyond the borders of the tendon. After this, the conjunctiva is carefully dissected from the underlying tendon, muscle and its bordering capsule as far back as desired. The capsule is button-holed above and below the tendon near its insertion, as performed both by Reese and by Jameson, care being exercised to make these openings well beyond the borders to avoid injury of the tendon and to prevent the bleeding which ensues if this is not done.

The Jameson strabismus hook is entered first through the upper buttonhole and made to present below the tendon from 2 to 3 mm. beyond its border, when the ball end may be used as a guide for the lower buttonhole. When the hook moves freely under the tendon, the

From the Department of Ophthalmology, University of Wisconsin.



A, a conjunctival incision is made over the insertion of the internus tendon. The incision is from 12 to 13 mm. long, 5.5 mm. from the limbus. *B*, the conjunctiva has been dissected from the tendon and the muscle, and is held away by a forceps. *C*, a strabismus hook has been inserted underneath the tendon, entering through a buttonhole in the capsule 2 mm. above its border, and is seen protruding under the capsule below where a similar buttonhole is made. *D*, a muscle forceps is inserted underneath the tendon, fixing it near its insertion. The lateral cuts in the capsule beyond the border of the muscle are shown. *E*, the tendon has been cut at its insertion, the free end being held in the forceps. The three sutures are shown as they are inserted near the free border of the tendon. One central mattress suture is inserted from underneath the tendon. The lateral wing sutures are single threads inserted from without in. The suture material is shown in black to illustrate better the mode of insertion. *F*, scleral sutures are shown before they are tied. The shaded areas in the sclera indicate the sutures as they appear when the superficial fibers only are penetrated (000 ten day chromic catgut). *G*, the scleral sutures are tied. *H*, the conjunctival incision is closed. Three interrupted catgut or silk sutures are used. In shadow the retroplaced tendon is shown with the scleral sutures completely buried.

Jameson forceps may be introduced from below, in the right eye, and from above in the left eye, and the tendon firmly clamped near its insertion, only enough space intervening to permit easy access for the scissors. A second hook may be introduced between which the forceps may be passed if desired. After the tendon and the tissue of the capsular border above and below are severed from their attachments, lateral diagonal cuts are made in the capsule, care being exercised to make these incisions in a diagonal diverging manner and not directly parallel to the muscle. This widening avoids injury to the tendon and muscle and gives added strength and stability. These cuts are made about from 6 to 8 mm. long. (I have not used the vertical slits in the capsule advocated by Jameson.) Following this, the loose attachments of the tendon and muscle to the globe are freed, and the sutures are inserted into the tendon just behind the forceps. I have used the old classic suture of Reese, namely, a central mattress suture and two wing sutures. The central mattress suture may be inserted exactly as devised by Reese, namely, from underneath the tendon outward, or, if preferred, the suture can be inserted from without inward. I prefer the former method. The wing sutures are placed 1.5 mm. from the upper and lower borders of the tendon and capsule. The conjunctiva is not included in these sutures. The needles, as mentioned before, are introduced close behind the resection forceps. After this the forceps is removed, and the stitches are completed in the sclera. The needles are introduced in the sclera after the manner of Jameson, care being taken to pick up the outer scleral fibers only, the puncture being about 2 mm. long. The catgut can be seen shining through the scleral fibers, as so excellently described by Jameson, when the sutures are properly introduced. The central mattress suture is first introduced and is followed by the wing sutures. The mattress suture is first tied gently but firmly, three knots being used, and the suture is cut fairly short. Following this, the two wing sutures are tied with three knots. After this the conjunctiva is brought back to its original insertion and closed by interrupted sutures, 000 or 00 catgut or silk sutures being used, thus completely burying the scleral sutures. So far the buried sutures have held well, and absorption seems to be complete.

I realize that there may be criticism of too many scleral openings in this manner of suturing. They are fairly well separated, however, by the wide tendon and capsular border which is present if the incision is properly made. When recession of the external rectus muscle is done, this technic is not so essential, though it has proved simple and easily carried out.

The needles and 000 chromic catgut for scleral suturing are those devised by Jameson. I have also used the especially prepared eyeless needles put up in sterile solution in glass ampules, manufactured by Davis and Geck. The atraumatic feature of the eyeless needle and the single strand of catgut are definite aids in reducing trauma. I have found, however, that these needles are more difficult to introduce than the regular Jameson needle owing to the fact that they do not exactly conform to its design. Also, the strand of suture material is too long and so causes unnecessary trauma when it is drawn through the scleral wound. If the original needle with the eyeless feature could be combined

with a shorter strand of catgut, it would be ideal.[1] The use of catgut in the conjunctival suturing is also helpful, since it eliminates removal of sutures, for which patients are grateful, particularly young children. The reaction following this procedure has not been excessive and is comparable to that seen after the Reese resection and tenotomy.

The indications for the recession operation, together with the comments on the anatomy, physiology and general discussion of strabismus, are so ably presented in Dr. Jameson's various articles that there seems no need for further elaboration here. One hesitates to offer a modification of so satisfactorv and excellent an operation as that of Jameson's, but the greater ease of execution of this procedure by the described technic, in my hands at least, has prompted its suggestion for others.

1. Since I submitted this article for publication, Davis and Geck have furnished me with the shorter strands of catgut in the atraumatic eyeless needle. They have so modified the needle as to make it conform more nearly to the original Jameson design.

VIABILITY OF THE MARGIN OF THE LID WITH CILIA AFTER TWENTY-FOUR HOURS IN THE EYEBALL

BEN WITT KEY, M.D., NEW YORK

The viability of living tissue, however small, and in whatever manner demonstrated, is always of fascinating interest and of far-reaching value, whether it is proved by a clinical or by a research demonstration. Because of this interest and because of the unusual opportunity which a case offered for this purpose, and also because of the uncertainty which attended the effort at repair in this case, I wish to present the following report.

REPORT OF CASE

Mrs. M. D., aged 38, on March 10, 1933, at 4:30 p. m., received an injury to her right eye and eyelids from the explosion of a seltzer bottle. She called to see me two hours later, when it was found that there were two deep lacerations of the upper lid (fig. 1); the lower lid was completely divided, near the outer canthus, and the margin of the lower lid from this point to a point about three fourths of an inch (1.9 cm.) nasalward was bleeding and without cilia. The globe was collapsed, and there was a long horizontal wound across the lower limbus of the cornea and through the sclerotic and ciliary body on either side. Through this wound vitreous protruded, and the torn iris was prolapsed. The blood-tinged aqueous obscured in a measure a curled-up whitish object in the region of the lens, but the character of this object could not be determined. It was believed to be a foreign body. The distress of the patient would not permit further investigation. She was sent to the New York Eye and Ear Infirmary at once, where she passed a fairly comfortable night.

Presented before the Section of Ophthalmology, New York Academy of Medicine, Nov. 20, 1933.

At 4:30 p. m. on the following day, twenty-four hours after the accident, the lids were repaired and the globe removed. A gold ball was implanted. Before removing the globe, the curled-up whitish tissue in the eyeball was removed with a forceps, and it was found to be the margin of the lower lid, about 1.5 mm. thick, 2.5 mm. wide, and about 16 mm. in length. In it were counted nineteen cilia. The lid margin was placed in a fold of gauze saturated in warm physiologic solution of sodium chloride while the globe was being removed and the gold ball implanted. Three small Kalt needles threaded with French silk (no. 000) were used in suturing (three sutures were taken) the narrow strip of tissue along

Fig. 1.—Drawing of the eye showing the extent of the injury.

Fig. 2.—Result of the operation.

the bleeding margin, which had been prepared by gentle scarification with a cataract knife. The needles were carried through the tissue and through the lower tarsal plate. The sutures were tied, but not too tightly. The dressing was made firm. Five days later the eye was dressed, and the sutures were removed.

At the time of preparation of this article, eight months after the accident, the margin of the lid is in its original position; no deformity whatever is present; and fifteen of the nineteen cilia remain in their normal position (fig. 2).

A search of the literature for reports of similar cases has revealed many instances of replacement of a part of the lid after injury, but

no report has been found of a case in which the tissue of the lid was removed from the interior of the eyeball and, when replaced, proved to be viable.

The uncertainty which attended the replacement of this delicate margin of the lid with its cilia must be admitted. Especially was this true when this white bloodless strip of curled-up tissue, apparently so lifeless, was unfolded. But, of course, it was recognized that it had been naturally incubated for twenty-four hours in normal lymph at body temperature, and, therefore, the possibility that the tissue might be viable led me to replace it with sutures. The outcome was anticipated with unusual interest. The retention of fifteen of the original nineteen cilia seems worthy of note.

DISCUSSION

DR. WILLIAM BROWN DOHERTY: This case presents two very unusual characteristics: First, it is unique in the fact that a similar case has not been reported in the literature, and second, that the very small strip of the margin of the lid, which did not appear viable, proved to be. I believe that the success of Dr. Key's operation was due to the fact that little trauma was produced in sewing this small strip of tissue in position.

Correspondence

To the Editor:—In connection with the interesting article entitled "Bilateral Glioma Treated by Radium" by Dr. Hans Barkan in the January, 1934, issue of the ARCHIVES OF OPHTHALMOLOGY, I should like to submit the following comments. In submitting them, I wish to pay my respects to the thoroughness of Dr. Barkan's survey, but I cannot avoid feeling that he is somewhat biased. In the second paragraph, for example, he makes the statement, "For all the other conditions mentioned they [radium or roentgen rays] are of little or no value," yet there are many reports in the literature of satisfactory results from roentgen treatment of blepharitis, hordeolum, eczema of the lid and angioma.

In the next paragraph, Dr. Barkan makes the statement, "The first method is that of enucleation with subsequent irradiation." It is generally admitted now that adequate antecedent or preoperative irradiation is much better than postoperative irradiation. Since there is no large series of case reports dealing with protracted fractional roentgen irradiation (Coutard technic), it seems rather dogmatic to state that irradiation is incomparably more dangerous to life than operation. Again, the statement is made that "Roentgenograms will often show multiple small metastases of the cranial bones, and death is likely to occur within a short period of time." There are many reports of survival and cure for periods of from three to seven years following thorough roentgen irradiation of the skull for multiple metastases.

Again, the point is made that the surgeon should keep in touch with the patient in order to examine the remaining eye following unilateral enucleation for glioma, and yet, in spite of case 7 (Mark J. Schoenberg), no mention is made of the value of vigorous prophylactic roentgen irradiation while the patient is being observed.

While agreeing that the spontaneous disappearance of gliomatous nodules is well authenticated, it seems distinctly biased to note that captious critics might merely take the point of view that cures by radium and roentgen therapy were accounted for by such disappearance. Why not include surgical intervention as well, especially when so many patients do not appear to develop disease in the opposite eye following operation?

I believe that it is worth while noting in connection with the report of case 1 that it is practically impossible under the conditions mentioned to protect the lens from the roentgen rays by filtering through a lead plate (owing to scattering, etc.). Also, in case 2, with an x-ray tube of the type mentioned, a filter of 30 mm. of aluminum would probably prevent any rays from reaching the eye.

Lastly, it might be fair to point out that the technic and apparatus for adequate roentgen treatment of tumors has undergone radical changes since 1920, and results in the treatment of neoplastic lesions in general, for example, carcinoma of the breast, are at least 100 per cent better at the present time than they were *before 1920*. This, of course, still leaves much room for improvement, but since the treatment in all of the cases quoted from the literature by Dr. Barkan was given before 1920, the point is worth remembering. Practically no apparatus for high voltage roentgen therapy was in clinical use before 1923.

L. H. GARLAND, M.D., San Francisco.
Assistant Clinical Professor of Medicine (Radiology),
Stanford University Medical School.

News and Notes

EDITED BY DR. JOHN HERBERT WAITE

GENERAL NEWS

Lectures by Bielschowsky.—Prof. Alfred Bielschowsky of Breslau is conducting courses on ocular muscles and speaking on topics of ophthalmologic interest as the guest of ophthalmic groups in the larger eye centers of the United States.

DEATHS

Prof. A. Angelucci, dean of Italian ophthalmologists and editor of *Archivio di ottalmologia* for many years, died at Naples in December, 1933.

CORRECTIONS

In the article by H. M. Dekking, "Color Photography of the Eye," in the February issue (ARCH. OPHTH. **11**:225, 1932) the first and third illustrations have been transposed—the one at the bottom is *A* and that at the top, *C*; also, the two lower pictures, which should be lettered *B* and *A*, are upside down.

An error occurred in the article by Wendell L. Hughes, "Prolonged Occlusion Test: Illustrative Cases," also in the February issue (**11**:229, 1934). The first line on page 236 should read: "CASE 8.—S. A. H., a typist, had headaches toward afternoon. Refractive cor-"

Obituary

JOHN BOWRING LAWFORD

1858-1934

British ophthalmology has lost another of its eminent members by the death of Mr. Lawford, on Jan. 3, 1934, in Ashtead, Surrey.

Lawford was born in Montreal in 1858, and received his medical education at McGill University. He then went to London, where he joined the school at St. Thomas' Hospital. After serving as house surgeon at Moorfields Eye Hospital, he acted as curator of that celebrated institution and assisted Edward Nettleship at St. Thomas' Hospital. Under the guidance of this eminent master, he became an unusually well qualified ophthalmologist.

Lawford was identified with all of the ophthalmic journals in England and made important contributions to the *Royal London Ophthalmic Hospital Reports,* the *Transactions of the Ophthalmological Society of the United Kingdom,* and the *Ophthalmic Review.* He was one of the originators of the *British Journal of Ophthalmology,* and served as its managing director for a number of years, contributing careful abstracts of papers from the *Archives d'ophtalmologie.* In addition to a large practice and literary and hospital work, he was interested and actively engaged in all public work connected with the blind.

A man of great modesty and of a quiet and unassuming manner, he was always ready to take up any task when called on.

Abstracts from Current Literature

EDITED BY DR. WILLIAM ZENTMAYER

Color Sense

THE PRINCIPLE OF INDUCTION IN COLOR VISION. F. ALLEN, Am. J. Ophth. **15:** 789 (Sept.) 1932.

The discovery of reflex inductive actions has an important bearing on the theories of color vision. Scores of theories have been devised in the attempt to surmount the difficulties of the subject. Only two of these, the theories of Young and Hering, have been widely accepted. The large number of persistency curves that the author and his associates have obtained have shown elevations and depressions, invariably in three portions, corresponding to the red, green and violet parts of the spectrum. The conclusion is therefore justified that these colors correspond to the three fundamental sensations of vision. In this respect the theory of Young is strikingly confirmed.

Hering recognized that opponent actions exist in the visual mechanism, and on this basis he assumed that certain pairs of color sensations, red-green, yellow-blue and white-black, were due to the antagonistic retinal processes of dissimilation and assimilation of three photochemical substances. As experiment now shows, opponent actions certainly exist but they are neural and not of chemical origin. The inductive actions are not themselves the cause of vision; their function is to control receptor sensitivity. The reflex action of any color is found to influence predominantly its complementary sensations, and this fact is in harmony with Hering's ideas. Hering also perceived that stimulated retinal areas reciprocally affected each other, though he was unable to suggest the process by which the mutual influences were exerted. This portion of the theory is also experimentally verified, and the process is discovered to be the visual sensory reflex or inductive actions. By these actions the fundamental parts of the two rival theories, so long irreconcilable, may now easily be harmonized with the trichromatic theory, and the prolonged controversy, it is hoped, may be brought to a close.

W. ZENTMAYER.

Conjunctiva

DYSTROPHY OF THE CORNEAL EPITHELIUM IN VERNAL CATARRH. M. N. BEIGELMAN, Am. J. Ophth. **15:** 95 (Feb.) 1932.

The author states that corneal involvement in vernal catarrh must be considered a frequent complication, although it does not usually impair vision. These lesions are generally extensions of the diseased process from the limbus, appearing (1) as vegetations identical with those at the limbus, (2) as a pannus-like gelatinous membrane, (3) as a lesion resembling sclerosing keratitis or (4) as a narrowing of the cornea in its horizontal meridian from limbal encroachment. Corneal complications occur also without any direct connection with the affected limbus. The author reports two cases of the latter type. In the first,

that of a man, aged 29, several circular opacities of the cornea appeared in the extrapupillary zone. They were limited to the epithelial area of one eye, had a slightly granular, lusterless appearance and did not stain with fluorescein. There were no concurrent inflammatory signs. In case 2, a youth, aged 19, exhibited vernal conjunctivitis of the tarsal type. In the upper temporal quadrant of the right cornea were two slightly depressed and somewhat rounded spots with a bridge of normally leveled and granular opaque substance between them. They were in the epithelial layer, and there was also an epithelial bedewing of this part of the cornea. A small part of this lesion was removed for microscopic study. The author concludes that the lesion is in the nature of a dystrophy of the corneal epithelium, arriving at this conclusion by an interesting discussion about corneal dystrophies in general.

W. S. Reese.

Comparative Ophthalmology

The Nictitating Gland of the Squirrel. N. Lœwenthal, Compt. rend. Soc. de biol. **113:** 725, 1933.

Adjoining the nictitating membrane is Harder's gland, but in addition the squirrel possesses a small zone of serous acinar tissue within the nictitating membrane itself. The gland measures at the most 2.5 mm. Its fine short excretory canal divides into two or three branches and discharges at the base of the nictitating membrane, about 1.4 mm. above the duct of Harder's gland. Minute glandular nodules are also present on the convex surface of the nictitating membrane, as in the hedgehog, rat and field-mouse, a condition that evidently represents an intermediate stage in the formation of an independent nictitating gland still conserved by the squirrel.

J. E. Lebensohn.

Cornea and Sclera

Hereditary and Familial Keratitis and Degeneration and Opacity of the Cornea. J. Rollet, Arch. d'opht. **50:** 161 (March) 1933.

The lesions which are included in this paper by Rollet have been described under the terms of keratitis, degeneration and dystrophy, and may appear in an otherwise normal eye at different periods of life. The cases are classified into those that are congenital and those that appear later in life. All the subdivisions are diagrammatically depicted.

In discussing the congenital group, which includes only two varieties, superficial and deep, the following are the general characteristics: The lesions are visible from birth and change very little if at all. If any change does occur the condition tends to improve. The lesions are in the nature of remains or a sequela of an intra-uterine process. This is an anomaly of development found in several members of the same family. It is a permanent malformation in contrast to the progressive changes of the second group. Furthermore, these congenital lesions produce no functional or subjective symptoms other than lowered visual acuity in proportion to the degree of disturbance of transparency. Case reports and pedigrees illustrate both the superficial and the deep varieties. The mode of transmission has not been demonstrated. The

deep variety is illustrated by a family observed by the author. In this instance the lesion had the appearance of a leukoma analogous to that seen after keratitis. Two theoretical explanations based on slit-lamp study are presented to explain the opacities: that the elements of the corneal stroma have been irregularly laid down as in the sclera, and that the stromal elements have not been sufficiently modified and contain substances which interfere with transparency.

The cases which appear later in life are of greater importance than the congenital cases. In contrast to the preceding group, these lesions most often develop slowly and fatally; sometimes, as in the case of recurrent erosions, they regress and disappear spontaneously. When there is loss of epithelium the possibility of infection is added and makes the understanding of these cases more difficult. The first type of the superficial variety of this second group is represented by recurring ulcerative heredofamilial keratitis or recurrent erosion of the cornea. Franceschetti has shown in a recent report that recurrent erosions of the cornea may have a heredofamilial basis. In the case reported by this author the onset was at the age of from 4 to 6 years, the first attack having been brought on by an injury. Usually as the victims grow older the attacks diminish in frequency and severity. The cure may be complete or with a nebula. It acts as a dominant character, passing by direct transmission, not propagated by those who are immune.

The second type of the superficial variety is a reticular, superficial form. The term "reticular" was suggested by Koby, who has described the condition in detail. It occurs in middle-aged persons. Its development is extremely slow, without pain or inflammation, the patient having the sensation of a cloud before the eyes, vision gradually failing. The patient is otherwise healthy. It is bilateral, but to an unequal degree. The central portion of the cornea presents a faint opalescent appearance, limited above, as a rule, by a superficial line, like a thread of mucus. It has three characteristics under biomicroscopic examination, which are (1) zones of bedewing of the epithelium with fine opacities, (2) crevices in Bowman's membrane and (3) an epithelial line in relief. According to Koby, the lesion is situated in the neighborhood of Bowman's membrane.

The third type of this subdivision is the speckled. The author presents the pedigree of a case which he had previously reported as belonging to the reticular type described by Koby. In this condition the onset occurs between the ages of 9 and 12. Gradual failure of vision occurs, accompanied by pain, itching, congestion and tearing. The center of the cornea is especially vulnerable, and with the naked eye a large number of whitish, superficial spots are seen. With the biomicroscope an irregularity of the cornea is seen. In optical section the lesion is seen to be situated in front of Bowman's membrane, which is normal.

The second group of late-appearing heredofamilial conditions deals with the interstitial or deep varieties. These are especially slow in development and are in the nature of a degeneration or dystrophy. They may appear soon after birth, during childhood or adolescence, or even at an adult age. The lesions involve the stroma of the cornea.

The first three types are fairly well demarcated. These are the nodular, the speckled and the neuro-edematous. The fourth or plexi-

form type is not so clearly defined. In it there may or may not be specks, nodules and striae. Its polymorphous nature is such that its subsequent course alone determines the diagnosis.

The nodular type is the nodular keratitis first described by Groenow in 1890. Some doubt was entertained as to whether this is a dystrophy until Koby's recent careful report. Failure of vision takes place slowly. There are few symptoms. Its onset is in adolescence. Nodules of a hyaline, whitish, yellowish or grayish color are seen in the cornea and produce elevations on its surface, depending on their location. Its course is slow.

The speckled type is that which Fehr and Hambresin have carefully described. The author presents the pedigree in a personal case. White specks are seen in the center of the cornea which appear as plates in the stroma and never raise the corneal surface. The cornea maintains its transparency; the nerve fibers remain normal and are unrelated to the specks. Sensation is normal. Slow progressive changes take place, resulting in partial blindness.

The neuro-edematous type consists in a change in the nerve fibers best seen with the biomicroscope. The onset is slow, with intermittent attacks of pain, photophobia, congestion and tearing. Radiating striae are seen in the middle third of the cornea, with a distribution and branching characteristic of nerve fibers about five times their thickness. These striae are made up of fine granules, no fibrillae being visible. Although the cornea remains normal for a long time, ulceration is liable to occur. Folds in Descemet's membrane may be seen as the disturbance progresses, and in old cases the corneal opacities sometimes have the appearance of calcified deposits. This form of degeneration occurs in adults.

The plexiform type of interstitial degeneration occurs in a variable form made up of specks and striae. It throws doubt on the classification of these hereditary corneal lesions, for the lesions may appear as though they were stages of transition from one form to another.

The latter part of this extensive contribution is devoted to the discussion of the pathology, etiology, diagnosis, prognosis and treatment of these various conditions.

S. B. MARLOW.

A CASE OF SUBEPITHELIAL HEMATOMA OF THE CORNEA. H. GOLDMANN, Klin. Monatsbl. f. Augenh. **89**: 216 (Aug.) 1932.

A man, aged 66, had a cataract extracted from an eye which presented a deep anterior chamber, two thirds of which was filled by vitreous, prolapsed between the lens and the lower border of the iris. Slight loss of vitreous followed extraction with the scoop. Postoperative iridocyclitis developed on the twelfth day. It subsided gradually, but on the seventeenth day after its onset four small hematomas suddenly appeared in the surface of the cornea, about 1.5 mm. below the scar; they arose from newly formed conjunctival vessels at the limbus. The four hematomas were connected by the blood vessels and located between the epithelium and Bowman's membrane. The inflammation had caused lesions of the newly formed vessels.

K. L. STOLL.

Experimental Pathology

THE PATHOLOGIC CHANGES IN LESIONS OF THE EYE RESULTING FROM INFECTION BY TREPONEMA CUNICULI. BURGHGRAEVE, Arch. d'opht. **50:** 64 (Jan.) 1933.

The author describes three types of ocular inflammation produced in rabbits by different strains of Treponema cuniculi. The first is a papulosquamous ulceration of the lid produced by inoculation after scarification. In one case the lesion appeared after an incubation period of a month. The lesion was excised and examined. The skin was found to be ulcerated, the loss of tissue in places extending to the germinal layer. Immediately below the papillae a massive leukocytic infiltration was found in the subcutaneous tissue. A large number of wandering cells were present between the muscle of the lid and the conjunctiva. The meibomian glands and conjunctiva were normal. The second type of lesion is an iridocyclitis which first appeared three months after inoculation. The histologic picture showed edema of the iris and ciliary processes, infiltration of the cornea and mild inflammation of the iris and ciliary body. The third type of lesion described is granuloma of the cornea. It is very late in appearing. It was produced by scarification of the cornea three days after inoculation of the lids as previously described. The first evidence of corneal disturbance appeared about four months later. The cornea was examined one year after the first appearance of the lesion. The main pathologic changes consisted in hyperplasia of the connective tissue, infiltration with leukocytes, eosinophils and plasma cells, accumulation of wandering cells immediately beneath the epithelium and very discrete infiltration of the epithelium. Numerous dilated capillaries invaded the anterior layers of the cornea. The superficial layers of the epithelium were destroyed, and the deeper layers were greatly altered.

S. B. MARLOW.

EFFECT OF PENETRATING INFRA-RED RAYS ON THE LIVING CORNEA. H. WAGNER, Arch. f. Ophth. **129:** 339 (Jan.) 1933.

In these experiments the author used the shorter waves of the infra-red group and found the permeability of water or quartz for those rays very great. The fresh cornea of man or of the rabbit was also easily permeable for those rays and remained intact although a blackened thermometer put in the course of the infra-red rays after they had passed the cornea indicated temperatures ranging between 200 and 300 C. It is therefore understandable that the cornea of the glassblower and the steel mill laborer remains normal while the crystalline lens is being damaged. The shorter infra-red rays are the only rays which go through the tunics of the globe and leave them uninjured. If, on the other hand, the longer infra-red rays are applied, even in much smaller quantities, drying out and burning of the cornea occur very easily. Thus the general law that rays damage tissues only if they are absorbed by them also applies to the eye.

Slit-lamp examination of the eyes of glassblowers exposed to penetrating infra-red rays revealed no anomalies of the conjunctiva, cornea or iris. The theory of Goldmann that glassblowers' cataract is a heat

cataract is therefore rejected. The author's experiments speak in favor of Vogt's opinion (1919) that only the penetrating infra-red rays can do damage to the lens.

P. C. KRONFELD.

EFFECT OF LONG-WAVE INFRA-RED RAYS ON THE RABBIT'S EYE. K. JOSURAN, Arch. f. Ophth. **129:** 353 (Jan.) 1933.

Only large quantities of nonpenetrating (long-wave) infra-red rays are harmful to the eye. Their effects are superficial burns of the cornea and conjunctiva.

P. C. KRONFELD.

EXPERIMENTAL HYPOTONIA. K. ALBRICH, Arch. f. Ophth. **129:** 468 (March) 1933.

Ocular hypotension was produced in rabbits in several different ways (luxation of the globe, injection of pilocarpine into the vitreous, Bier's suction hyperemia, the application of silver nitrate to the cornea and the use of epinephrine), and the weight and volume of the softened eye were compared with those of its normal mate. Special care was taken to prevent an outflow of blood from the eye before its volume and weight were measured. Thus it was found that experimental hypotonia in rabbits is nearly always accompanied by a reduction in the size of the globe. Only in rare cases was the softened eye larger and heavier than its mate. In some of these eyes increased tension had been present before the establishment of the hypotonia, and the fibrous tunic had been stretched. These findings are not in accord with those of Roemer and Schmidt, who found the volume of eyes which were hypotonic after the application of epinephrine generally greater than that of their mates.

P. C. KRONFELD.

General Diseases

MEASLES ENCEPHALITIS (A CLINICAL REPORT OF SOME EYE FINDINGS). P. HEATH, Am. J. Ophth. **15:** 130 (Feb.) 1932.

The history is given of a boy, aged 6 years, of Italian parentage, who in convalescing from a moderate attack of measles, on the eleventh day had sudden complete loss of sight without other signs at the time. Clinically, he soon showed typical encephalitis. The child had alternate intervals of lethargy and of excitation. The ocular signs varied so far as the size of the pupils and muscle balance were concerned, but for a period of over a week there was an ophthalmoscopic picture similar to bilateral central retinal arterial embolism.

The patient recovered his vision almost completely with minor residual changes so far as ophthalmoscopic findings were concerned, but he continued to show distinct changes in personality and disturbances in behavior with sadistic tendencies.

W. S. REESE.

Glaucoma

THE TREATMENT OF GLAUCOMA. B. W. RYCROFT, Brit. M. J. **2:** 523 (Sept. 10) 1933.

This is an abstract of an essay awarded the Middlemore prize of the British Medical Association, 1933.

The author gives an excellent classification of the various causes of glaucoma. He then takes up the subject of the treatment of glaucoma simplex, which he classifies under (1) acute or congestive glaucoma and (2) chronic glaucoma, (*a*) with acute exacerbations and (*b*) without acute exacerbations.

The medical treatment of acute glaucoma may be summarized as follows: 1. The patient is put to bed sitting up. 2. Acetylsalicylic acid or morphine is administered for relief of the pain. 3. Leeches are applied to the outer canthus. 4. Miotics are instilled locally. 5. Hydragogue cathartics are used. 6. The electric eye warmer is applied. 7. The tension is reduced by diathermy or the use of saline solution. 8. Operation is performed with the patient under subtenon or retrobulbar procaine hydrochloride anesthesia.

In chronic glaucoma the nonoperative treatment consists in: (1) a medical investigation of the cardiovascular system, with due attention to hyperpiesis and renal dysfunction; (2) the elimination of gross foci of sepsis; (3) the guarded use of miotics until such time as deterioration of vision is no longer controlled, and (4) coincidentally, the use of prolonged massage of the eye.

The indications for operation in chronic glaucoma consist in an increasing frequency of acute exacerbations, an increase of relative scotomas and loss of visual field and a persistent high tonometric tension.

In discussing the physiologic basis of the treatment, the author thinks that the cause of the disease was revealed in Fischer's investigation of 1909, that glaucoma is really edema of the eyeball, in which the hydrophilic colloids retain an increasing amount of water.

At the suggestion of Duke-Elder Rycroft has studied the effect of histamine on the eye, and has endeavored to discover its presence in the aqueous in cases of acute glaucoma. He concludes that there is a close relationship between the effects of histamine on the eye and the clinical picture of acute glaucoma; however, it was not possible to detect the presence of histamine in the aqueous in the cases he studied.

A. KNAPP.

LAGRANGE OPERATION: SURGICAL TREATMENT FOR GLAUCOMA. M. DUVERGER, Arch. d'opht. **50**: 316 (May) 1933.

Duverger believes that the Lagrange operation should replace all other operations for chronic glaucoma and replace iridectomy for acute glaucoma, and should be supplementary to medical and surgical procedures that fail to reduce the tension in secondary glaucoma. Although fistulizing operations are performed by a large majority of ophthalmologists, they are not done often enough or soon enough or with sufficient discernment. The results reported are so varying for the different types of operation that the general impression is that they are the last resort and cannot be depended on. In chronic glaucoma operation should be resorted to as soon as miotic treatment fails to control the tension. The choice of operation in chronic glaucoma is important. The author believes that iridectomy should be completely abandoned. He is opposed to iris inclusion on the grounds of the complications which result following operation for cataract; cyclodialysis he believes too uncertain in its results. Although he has had

some good results from trephining, the complications which may occur early and late are objectionable. He reserves this operation for infantile glaucoma. For the adult the author thinks that the Lagrange operation, properly performed, with excision of the scleral tongue with a knife as he has advocated in conjunction with Velter, is least apt to cause complications and gives the best long-standing results. He briefly mentions the salient points of the operative technic advocated. The functional results will be related to the degree of damage present before operation. The best results will be obtained in those cases in which the vision remains nearly normal and the field only slightly contracted. Good results can be obtained in more advanced cases. In cases in which there is considerable loss of vision and the field is contracted close to the point of fixation, the author has never seen any further loss following operation. In cases with moderate tension (from 25 to 40 mm.) the results are uniform and lasting. In cases with low tension (from 20 to 25 mm.) the results are not so regular. In cases with high tension (from 45 to 60 mm.) the results are very good in 75 per cent of the cases.

Duverger advocates the Lagrange operation for acute glaucoma although it is more difficult to perform under these conditions. He never has believed in iridectomy. He thinks that the incision of the globe is the important factor and that the iridectomy is accessory, being indispensable to prevent prolapse. The operation is performed as in the chronic cases, with the exception that the iridectomy is complete. He has resorted to the Lagrange operation exclusively in acute cases for about five years. Under certain conditions this operation can also be employed for secondary glaucoma. Its use on eyes with absolute glaucoma has resulted in the relief of symptoms and the avoidance of mutilating operations.

S. B. MARLOW.

THE RELATION BETWEEN CALCIUM AND POTASSIUM IN THE BLOOD OF GLAUCOMATOUS PATIENTS. A. BIFFIS, Ann. di ottal. e clin. ocul. **61**: 284 (April) 1933.

This relationship has been studied because of the rôle of calcium in preventing edema and as a stimulant of the sympathetic nervous system, potassium being its opponent in these respects. Previous reports, which are contradictory and often based on very small numbers of cases, are reviewed.

The author examined the blood of twenty normal persons between the ages of 48 and 82, and of fifty patients with primary glaucoma between the ages of 46 and 82.

In the normal series the average for calcium was 10.79 mg. per hundred cubic centimeters, and that for potassium, 19.44 mg., giving a potassium-calcium quotient of 1.82. In the glaucomatous patients the average for calcium was 9.98 mg., and for potassium, 20.35, giving a potassium-calcium quotient of 2.05. Although there were marked variations between the higher and lower figures in each series, the author believes that the size of the series justifies the conclusion that in primary glaucoma a slight deficiency in calcium and an increase in potassium are present. This would be expected to cause parasympathicotonia with an

increase in capillary permeability and a tendency of the intra-ocular colloids to swell. There would also exist under such conditions a relative alkalosis of the tissues.

S. R. GIFFORD.

FREQUENCY OF GLAUCOMA IN CHINA. A. PILLAT, Arch. f. Ophth. 129: 299 (Jan.) 1933.

The author draws a sad picture of the glaucoma situation in North China. Of the 144 patients suffering from primary glaucoma who presented themselves at the ophthalmologic clinic of the Peiping Union Medical College 48.6 per cent were blind in one eye and 31.2 per cent were blind in both eyes. Pillat blames this on an unusual frequency of the simple, perfectly compensated type of glaucoma, on the ignorance of the Chinese in medical matters, on their peculiar attitude toward any disease and on the fact that they try various drugs and procedures suggested by their traditional system of medicine for a long time before they consult the Chinese or foreign ophthalmologist of European or American training. Additional factors are the enormous distances and inadequate means of transportation, which also account for the great frequency of the late stages of glaucoma seen in the clinic. For the same reasons, it is impossible to do any follow-up work on glaucomatous patients in China.

From his observations on the Chinese, Pillat rejects the pigment theory of glaucoma. Pigment between the trabeculae of the pectinate ligament is a common finding in the yellow race. Degenerative processes of the pigment epithelium which lead to the formation of dark brown clouds in the anterior chamber during intra-ocular operations are also frequent. Nevertheless, the intra-ocular tension remains low in these cases. Predisposing factors for glaucoma among the Chinese may be repeated burns of the conjunctiva, produced intentionally in Chinese lay therapy, and perhaps also the severe psychic emotions ("explosions") which are in severity and duration much more pronounced than the reactions of the Caucasian.

P. C. KRONFELD.

INFLAMMATORY GLAUCOMA WITHOUT INCREASED TENSION: REPORT OF CASES. C. CHARLIN and A. SCHWEITZER, Klin. Monatsbl. f. Augenh. 89: 88 (July) 1932.

Chronic glaucoma may run its course without permanent increase of tension. Occasional cases of inflammatory glaucoma occur, presenting typical attacks with congestion, mydriasis and pain, but normal tension. Three cases of this type are reported. The first patient, a man, aged 70, had periodic pain in his left eye for a year, which had returned a few days prior to examination. Congestion and moderate mydriasis were present; vision was normal, and the tension was 22 mm., against 18 mm. in the right eye; pilocarpine was ordered. The tension was 16 mm. in the right eye and 26 mm. in the left on the following morning. It rose to 26 mm. in the right eye and to 42 mm. in the left after one hour's rest in the dark room. A typical glaucomatous attack occurred during the following night, which required operation. The patient returned with an acute glaucoma in the right eye three months later.

Similar conditions existed in the second patient, a woman, aged 51, with chronic glaucoma. Rest in the dark room for one-half hour failed to produce a marked increase of tension. The tension rose, however, to 42 mm. in the right eye and 50 mm. in the left after application of a binocular bandage during the night.

K. L. STOLL.

Injuries

MIGRATORY FOREIGN BODIES OF THE EYE. SABADEANU, Arch. d'opht. **50:** 134 (Feb.) 1933.

The appearance of the report of Lampert and Lambert in October, 1931, at about the same time that the author had a similar case under observation stimulated him to search the literature thoroughly for other cases and to report his own. The earliest case that he could find was that published by Milucki in 1880. Since then about twenty-five different observers have reported one or more cases. These are all briefly reviewed, and the references are given. Two cases have been published recently, one by Michail and the second by Lampert and Lambert. The author describes his case in detail; several foreign bodies appeared successively in the anterior part of the vitreous following extraction of a cataract. They had been present following a wound sustained during the World War. The mechanism by which these foreign bodies migrate is discussed. In his case the author is inclined to believe that both the exudate and the operative procedures were factors. He does not believe that any single explanation applies to all cases. He points out the medicolegal aspects of this question, and as the result of his experience suggests that elimination of the non-magnetic foreign bodies may be helped by repeated puncture of the anterior chamber.

S. B. MARLOW.

Lacrimal Apparatus

DACRYOCYSTITIS AND PNEUMOCOCCI. H. BRACCI-TORSI, Ann. di ottal. e clin. ocul. **61:** 29 (June) 1933.

Previous investigations of the bacteriology of the lacrimal sac are reviewed, especially those in which the type of pneumococcus was determined. The author studied seventy-eight cases, fifty-seven of dacryocystitis and twenty-one of dacryocystitis complicated by hypopyon keratitis, before and after removal of the sac. The organisms recovered on laked blood agar were tested with bile and by their reaction to ethyl-hydrocupreine.

In all but two cases pneumococci were recovered before operation. In simple cases, there were nine strains of type I, four of type II, three of type I-II and thirty-nine of type IV. In cases of keratitis, eleven strains of type I were found, three of type II, one of type I-II and only six of type IV. Seven days after operation pneumococci were still present in fifty-seven of the fifty-nine simple cases. In fifty-five of these they were not found after from forty to sixty days, while in two they were found after from three to four months. The greater frequency of types I and II in the cases of keratitis is in line with the known virulence of these types. Type III, the most virulent, was not found.

S. R. GIFFORD.

Lens

A Procedure for the Extraction of Congenital, Soft and Membranous Cataracts. O. Barkan, Am. J. Ophth. **15:** 117 (Feb.) 1932.

The author reviews the various methods of operating on cataracts. He suggests the use of epinephrine subconjunctivally to produce hypotony of the globe and maximum dilation of the pupil. He also makes an oblique incision with a keratome 1 or 2 mm. from the limbus. This valvelike incision tends to close, especially when the pressure in the anterior chamber increases.

W. S. Reese.

Dislocation of the Ring of Soemmering: Its Removal; With Some Notes on Its Pathology. F. Tooke, Brit. J. Ophth. **17:** 466 (Aug.) 1933.

The author describes the condition as the capsular remains of a cataractous lens, containing, as is usually the case, some retained cortical cells, the center of the lens having been penetrated and an aperture created by some intentional operative procedure, or possibly by a penetrating wound of unintentional or accidental character. The cases in the literature are briefly reviewed.

Tooke's case occurred in a man, aged 43. He was first examined in 1914. Fifteen years earlier both eyes had been operated on for myopia. Vision of the right eye was lost owing to detachment of the retina. Vision of the left eye with a low minus glass was 6/15. In 1929, he was struck in the left eye. This resulted in a material reduction of vision. Through the pupil, and lying obliquely forward and outward, appeared the "ring." It was situated partly in the posterior and partly in the anterior chamber. It did not alter its situation with any change in the position of the body. The ring appeared like a tiny, swollen pessary, which was round and measured from 12 to 14 mm. in diameter, was pearl-gray and had a hole in its center. Vision equaled 6/36. With the slit lamp, its surface was bright and glistening, and the capsule presenting anteriorly was taut and smooth. The removal of the ring was accomplished by making a conjunctival flap, transfixing the ring with a knife-needle, making a corneal section and then passing the blades of a Kalt forceps, one behind and one in front of the ring, meeting in the center of the aperture. The needle was then withdrawn, and the ring drawn out with the forceps. A detailed description of the histology of the ring is given. The anterior capsule of the lens at one or two points was split up into two or more strata of even, regular strands or bands. The interlaminar spaces contained no cells. The cuboidal cells lining the remaining capsule existed as a single row. The same simple arrangement was present in the cells against the adjacent anterior cortical lamellae. The author's case is the first reported in the literature in which pathologic investigation was carried out. The article is illustrated.

W. Zentmayer.

Choice of Operation for Cataract on a Previously Trephined Eye. R. H. Elliot, Brit. M. J. **1:** 958 (June 3) 1933.

Cataract associated with glaucoma is always a difficult problem. The first signs of opacity are seen in the depth of the lens and can

therefore be recorded as being independent of any interference with the capsule, though it is possible that the lenticular nutrition is interfered with. One of the complications in this form of cataract is that the cataract is rarely mature; the optic nerve has been damaged to some extent and conditions are not as favorable for operation as in the usual case of cataract. The most important consideration is the necessity of avoiding interference with the filtering scar, and Colonel Elliot has endeavored to find a suitable technic. The problem, he states, has been made more difficult by the fact that since 1920 he has included a conjunctival bridge as a routine in all operations for cataract. The objection to a wholly corneal incision is that there is delay in the healing of the section. The following method was finally decided on: One transfixes the cornea in the usual way with the cataract knife, cutting out along the sclerocorneal margin until nearly clear of the filtering pad and then making a broad bridge either upward and outward or upward and inward, thus coming to the outer or inner side of the filtering scar. This is much more difficult than the ordinary bridge; while a conjunctival bridge is made with comparative ease, it is often difficult to get it exactly where one wants it, as is the case in eyes with a filtering scar. If the operation succeeds, the bridge will furnish protection from escape of vitreous, insure immediate closure of the wound by the straplike action of the conjunctival bridge and result in early and complete healing of the whole incision without interference with the filtering scar.

The time to operate on a cataract following glaucoma arises when vision is no longer useful. The prognosis is necessarily less favorable in these cases than in the ordinary case of cataract. A. KNAPP.

BIOMICROSCOPIC ASPECTS OF ENDOCRINE CATARACT. L. MAZZI, Arch. di ottal. **40**: 32 (Jan.) 1933.

Two cases are reported of punctate opacities in the anterior and posterior cortex resembling the picture described by Weil and Nordmann. The endocrine disturbances were not marked in either case, and from the illustrations one case seems to resemble the combination of cataracta coronaria and caerulea not so infrequently seen in otherwise normal persons. The literature on so-called endocrine cataract is reviewed. S. R. GIFFORD.

PREOPERATIVE, OPERATIVE AND POSTOPERATIVE COMPLICATIONS OF EXTRACTION OF A CATARACT. F. POYALES, Rev. cubana de oto-neuro-oftal. **1**: 385 (Nov.-Dec.) 1932.

This is an exhaustive paper containing the results of the author's twenty years of experience with operations for cataracts. It deals with the different complications arising from preexisting local and general conditions and the means for overcoming them, the indications dependent on different conditions of the lens, the different operative procedures that the author employs and the complications that may arise during and after the operations. C. E. FINLAY.

COMPARISON OF THE CLINICAL AND HISTOLOGIC ASPECTS OF THE LAMELLAE OF THE ANTERIOR CAPSULE OF THE LENS IN OLD PERSONS AND IN FURNACE WORKERS. A. VOGT, Klin. Monatsbl. f. Augenh. **89:** 587 (Nov.) 1932.

A senile lamella on the anterior capsule of the lens and the lamella of the furnace worker are alike in that they develop only in the central two thirds of the axial region and never involve the area of the equator and the posterior capsule. Vogt found this condition on examining with the slit lamp and microscopically seven eyes of four elderly persons (with absolute capsular glaucoma in three eyes) and two lenses extracted from furnace workers. In both types, the pupillary disk was affected, and the adjoining portion of the anterior capsule was involved only so far as it was exposed to the grating of the pupillary margin of the iris. Detachment of the zonular lamella has nothing to do with these two types, which begin behind the seam of the iris. The formation of the lamella in the furnace worker is the result of the effect on the entire lens of penetrating infra-red rays and, perhaps, of the convection heat produced in the iris and lens.

The lamella of the furnace worker differs from the senile form in consisting of a single layer only, in possessing greater continuity and less fragility and in developing in younger persons, i. e., about two decades sooner than the senile type. An exact differentiation is impossible, as the coarse desquamation was observed in all lamellae caused by heat and in some senile cases. In both types coarse initial dissociation of isolated lamellae was observed, which in the senile type changed later on to fine lamellar desquamation. Besides the senile and thermic etiology, a chemical origin has been established. This was demonstrated in the living eye of a man, aged 55. The cataract, which had harbored two iron splinters for thirty years, was extracted and the anterior capsule showed localized desquamations comprising two or more layers.

The capsule of a secondary cataract may in the course of years show longitudinal fissures which may lead to the formation of vacuoles, a senile manifestation. This would indicate that the capsule of the secondary cataract, even if entirely separated from the lens, is subject to a process of maceration which dissolves the continuity of the lamellae.

Notwithstanding a number of differences between the two types of formation of a lamella, strict genetic and morphologic differentiation was impossible, owing to the scarcity of the material at hand and the lack of similar changes in animals.

K. L. STOLL.

A CASE OF RAPID DEVELOPMENT OF CATARACT. A. A. SMIRNOFF, Sovet. vestnik oftal. **2:** 68, 1933.

A woman, aged 27, noticed a few days prior to examination that the vision of the left eye became impaired within half an hour to the extent that she was compelled to discontinue her office work. She gave a history of convulsions during pregnancy a few years before. At that time, a cataract developed on the right eye within two weeks and was extracted. She also had convulsions two months previous to the loss of vision in the left eye. A familial history of cataracts was revealed by the patient. Her grandmother and father, an aunt and the aunt's

daughter had cataracts at an early age. Her brother's son had congenital cataracts removed at the age of 9 months.

On examination, the diagnosis was a soft cataract, with vision limited to perception of hand movements, in the left eye and aphacia of the right eye. The patient was operated on and good vision was obtained. The author believes that tetany was the cause of this cataract. He states that his is the only case reported in which cataract developed within such a short time.

O. SITCHEVSKA.

Methods of Examination

AN INVESTIGATION OF THE STRUCTURE OF THE EYE BY THE USE OF THE X-RAYS. E. HERTEL, Arch. f. Augenh. **107:** 259, 1933.

Following the work of M. von Laue (*Sitzungsb. d. math.-phys. Cl. d. k.-bayer. Akad. d. Wissensch.,* 1912) on the character of the roentgenograms of tissues, depending on their structure, a number of investigations were carried out on the various tissues of the eye. (The methods employed and the theories involved are too complex to be abstracted.)

Roentgenograms of the cornea, sclera, lens, vitreous, retina, iris and choroid were obtained.

Unless one is well versed in the theories of interference phenomena and modern physics, it will be difficult to follow the results of this research. The abstractor found himself in this predicament, but feels that the paper is probably valuable for those versed in these subjects.

F. H. ADLER.

VARIOUS METHODS OF RED-FREE OPHTHALMOSCOPY OF THE MACULA LUTEA AND ITS SURROUNDINGS. CHARLOTTE EIDENBENZ, Klin. Monatsbl. f. Augenh. **89:** 433 (Oct.) 1932.

In a preface to this article Vogt refers to his introduction of red-free light into ophthalmoscopy in 1913 for the study of the color of the macula lutea. The difficulties in selecting the correct current, lamp and necessary quantity of light are discussed. Eidenbenz renders a historical account of the research on the macula and the various methods employed in it. In a résumé she emphasizes the following points: Red-free ophthalmoscopy can be performed best by means of the direct focal light of the crater of an arc lamp with direct current. Other lights, especially bulbs, yield insufficient macular reflection to allow recognition of normal or pathologic conditions or the color of the macula. The alternating arc lamp is rejected. The size of the illuminated area depends on the size of the crater of the direct current arc lamp and the angle between the direction of the illumination and the optical longitudinal axis of the eye being examined. A small illuminated area will allow recognition of small details by an increase of the focal light, whereas they remain hidden in diffused light. The red-free method should not be used for more than a minute at a time. This precaution is recommended although lesions have never been observed after red-free ophthalmoscopy.

K. L. STOLL.

Neurology

MENINGEAL FIBROBLASTOMAS OF THE CEREBRUM. CHARLES H. FRAZIER and BERNARD J. ALPERS, Arch. Neurol. & Psychiat. **29:** 935 (May) 1933.

The authors review a series of seventy-five cases of meningeal fibroblastomas of the cerebrum seen in the clinic and laboratory of the hospital of the University of Pennsylvania. They call particular attention to the relative intactness of central vision when these tumors invade the occipital lobe as contrasted with the cases in which the temporal lobe was attacked. In the latter cases the central vision is usually implicated. This is a distinction to which Horrax and Putnam (*Tr. Am. Neurol. A.,* 1932, p. 115) called attention. They found that in cases of tumor of the temporal and occipital lobes a homonymous field defect usually occurs. In cases of tumor of the occipital lobe central vision is usually preserved, while in cases of lesion of the temporal lobe it is usually lost. This indicates that in lesions of the occipital lobe there is sparing of the macula, whereas in lesions of the temporal lobe the line of demarcation between the blind and the seeing half of the field runs through fixation.

F. H. ADLER.

CYCLIC PARALYSIS OF THE OCULOMOTOR NERVE: REPORT OF A CASE. A. W. H. MAK VAN WAAY, Klin. Monatsbl. f. Augenh. **89:** 36 (July) 1932.

A case of cyclic paralysis of the oculomotor nerve is reported in a boy, aged 9. The condition is considered congenital. Ptosis of the right eye was noticed three weeks after birth. The eye was firmly closed and could not be opened. The pupil was large and did not react to light and in convergence; upward, downward and inward rotation was almost entirely lacking. This aspect of complete oculomotor paralysis changed entirely on short notice; the lid could be raised, the pupil contracted and the globe could be brought nasalward to the median line. Simultaneously, the hyperopia of 4 diopters changed to 3 diopters of myopia. This change took place in regular intervals of three minutes during sleep while the left eye remained closed. Irritations of divers nature could not influence this cyclic course. A number of neurologic symptoms suggested chorea. The Wassermann reaction was negative. A ptosis operation, according to Hess' procedure, and tenotomy with advancement to prevent later divergence were done. A detailed review of the literature is given.

K. L. STOLL.

Operations

"BRIDLED" TENOTOMY. ALEXIADES, Arch. d'opht. **50:** 212 (March) 1933.

The chief objections to tenotomy in the treatment of strabismus are retraction of the caruncle, widening of the palpebral fissure with slight proptosis, the difficulty of measuring the effect at operation and, most important, the interference with convergence. The operation described is designed to avoid these objections. It consists in exposure of the

internal rectus muscle, placing a suture in the muscle before it is divided and passing the ends through the stump, where a provisional knot is tied which can subsequently be readjusted even several days after operation. The indications for the use of this procedure are mainly the same as when a tenotomy is done complementary to advancement. It may be employed for patients with equally good, or nearly equally good, vision in the two eyes before advancement is performed. It is also indicated in conjunction with advancement in paralytic cases. Its advantages are the possibility of making a free division of the muscle without fear of overcorrection and also of avoiding the necessity of a second operation, which it may be difficult to persuade the patient to accept.

S. B. MARLOW.

THE TECHNIC OF DIASCLERAL EXTRACTION OF IRON SPLINTERS LODGED FAR BACK IN THE SCLERA. J. KUBIK, Klin. Monatsbl. f. Augenh. **89:** 316 (Sept.) 1932.

Ten days prior to examination a splinter of iron perforated the right eye of a youth, aged 17, causing immediate reduction of vision. The point of entrance in the center of the cornea measured 1.5 mm., with a corresponding perforation in the anterior capsule of the now opaque lens. Repeated daily attempts to remove the splinter with Haab's magnet before and after removal of the swollen lens on the fifth day were futile. The remaining cortical substance was removed by suction later, so that the splinter could be seen embedded and movable in a white mass adjacent to the macula. The splinter was finally extracted with the giant magnet in the following manner: Temporary resection of the external rectus muscle and shifting to one side of the isolated inferior oblique permitted reaching the posterior pole by enforced adduction of the globe. After many vain attempts to reach the splinter with several magnet attachments through the scleral wound, a cyclodialysis spatula was introduced between the sclera and the choroid. Hirschberg's curved, thin, bill-shaped attachment was then introduced in this suprachoroidal pocket, and the fragment successfully removed. Reunion of retina, choroid and sclera was perfected by cauterization, and smooth recovery followed. Only three thirty-sixths of the normal vision was obtained on account of the lesion of the macula. The author considers this the safest method to prevent damage to the vitreous.

K. L. STOLL.

Pharmacology

PANTOCAIN AS A LOCAL ANESTHETIC IN OPHTHALMOLOGY. W. H. WILMER and R. T. PATON, Am. J. Ophth. **16:** 106 (Feb.) 1933.

The authors give a description and a therapeutic evaluation of *p*-n-butylaminobenzoate of dimethylaminoethanol hydrochloride (pantocaine) as used in the eye. They conclude that this drug will secure a permanent place in ophthalmologic examining and operating rooms.

W. S. REESE.

THE ACTION OF SYMPATHIN ON THE IRIS. Z. M. BACQ, Compt. rend. Soc. de biol. **112:** 1551, 1933.

In a cat in which the eye had been denervated and the suprarenals had been inactivated by surgical intervention, a mild pupillary dilatation regularly followed stimulation of the lower abdominal sympathetic chain, the hypogastric, or the sciatic nerves—measures that produce sympathin. When the sympathetic chain between the sixth and seventh lumbar ganglions was stimulated, dilatation commenced twenty seconds after the beginning of stimulation and reached its maximum in sixty seconds. When stimulation ceased, the pupil started to recede in twenty seconds but did not recover its previous diameter for two minutes. Sympathin therefore possesses a pupillodilator action similar to that of epinephrine.

J. E. LEBENSOHN.

ACTION OF EXTRACT OF THE ANTERIOR PITUITARY LOBE ON THE NORMAL AND ON THE PATHOLOGIC EYE. A. FERRARI, Arch. di ottal. **40:** 1 (Jan.) 1933.

When extract of the anterior lobe of the pituitary was instilled into the conjunctival sac, it produced slight miosis in rabbits' eyes and more marked miosis in normal human eyes. Subconjunctival injections produced more marked miosis in both and a slight decrease in intra-ocular tension in human eyes only. Subcutaneous and intravenous injections were without demonstrable effect on the eyes. In glaucomatous eyes neither instillation nor subconjunctival injections had any effect on the pupil or the intra-ocular tension. The author believes that the slight effect on normal eyes is through the neurovegetative system, and explains the absence of such an effect in glaucomatous eyes as due to the derangement of this system in glaucoma.

S. R. GIFFORD.

THE OCULAR PHARMACOLOGY AND TOXICOLOGY OF CARBAMINOYLCHOLINE. K. VELHAGEN, Arch. f. Augenh. **107:** 318, 1933.

Kreitmair (*Arch f. exper. Path. u. Pharmakol.* **164:** 346, 1932) found that carbaminoylcholine has a powerful stimulating effect on the parasympathetic system. It increases secretion, raises the tonus of smooth muscle, heightens peristalsis in the stomach, intestine and uterus, slows the pulse and lowers the blood pressure.

Velhagen investigated the effect of this drug on the eye. When dropped in the conjunctival culdesac, it constricts the pupil. It has an enormous effect on the isolated sphincter, being much superior to pilocarpine and only slightly inferior to physostigmine (eserine). A 0.75 per cent solution of carbaminoylcholine is equivalent to a 0.25 per cent solution of physostigmine. When dropped in the culdesac of rabbits, it lowers the intra-ocular pressure, and when injected into the blood stream, it lowers the blood pressure and intra-ocular pressure correspondingly.

This drug is slightly less toxic than physostigmine, and causes practically no subjective symptoms. It lowers the intra-ocular pressure in the glaucomatous eye, and the preparation is stable and not destroyed by heating. The author believes that carbaminoylcholine is another serviceable miotic.

F. H. ADLER.

Physiology

GLUTATHIONE IN THE COLORED AND IN THE ALBINOTIC IRIS. C. CORDERO, Arch. di ottal. **39:** 544 (Nov.-Dec.) 1932.

The author examined the irides of beeves, calves, horses, hogs and pigmented and albinotic rabbits, using ten of each group. Tunnicliff's method was employed. In the beef the average amount was 11.26 mg. per hundred grams; in the horse, 14.56 mg.; in the calf, 15.43 mg.; in the hog, 18.09 mg., and in the pigmented rabbits, 23.24 mg. The higher values among the smaller animals corresponded to previously reported findings in the lenses of the same groups of animals. In albinotic rabbits the amount was less than in pigmented rabbits, 21.71 mg.

S. R. GIFFORD.

THE POTASSIUM CONTENT IN THE HUMAN ANTERIOR CHAMBER. K. T. A. HALBERTSMA, Klin. Monatsbl. f. Augenh. **89:** 682 (Nov.) 1932.

Great importance has been attributed to potassium with reference to the etiology of glaucoma and to radiobiologic considerations. The author measured the potassium content in the anterior chamber of fifty patients, twenty-five of whom were operated on for glaucoma and twenty-five for cataract. The potassium content was the same for both groups, while the residue after heating was larger for the glaucomatous eyes. These results and those of measurements of the potassium content in the blood serum of patients with glaucoma prompted Halbertsma to doubt the importance of potassium in the genesis of glaucoma.

K. L. STOLL.

Refraction and Accommodation

DURATION OF THE ACCOMMODATIVE ACT IN PREGNANCY. G. ROSSI, Arch. di ottal. **40:** 17 (Jan.) 1933.

An apparatus is described for accurately recording the time required to read letters under conditions requiring accommodation. The difference between this time and that required to recognize letters without accommodation was taken as the time of accommodation. In seventeen pregnant women this time varied from 0.17 to 0.24 second. It was practically the same after the termination of pregnancy, and the author concludes that there is no constant change during pregnancy.

S. R. GIFFORD.

POSSIBLE ACCURACY OF THE SUBJECTIVE REFRACTION TEST. A. KÜHL, Arch. f. Ophth. **129:** 455 (March) 1933.

Donders' classic method of determining the refractive error is based on two criteria: 1. The visual acuity obtained with the correcting lens must be the maximum visual acuity for the eye tested. 2. The visual acuity must drop to two thirds of its maximum, or less, if the "correct" correcting lens is increased by +0.50 diopter. It is generally believed that the fulfilment of the first condition does not prove the correctness of the respective lens unless accommodation has been eliminated.

According to the author, good observers indicate only one very sharp and narrow maximum of visual acuity, as far as the range of correcting lenses is concerned. Additional minus or less plus lenses beyond that point lower the visual acuity. Two reasons are given for this reduction in acuity: (1) reduction in the size of the retinal image because of the shifting of the anterior focal point of the eye during accommodation, and (2) perhaps a change in the optical qualities of the lens in the state of accommodation.

The charting of visual acuity correctly determined against the correcting lens leads to interesting curves, the lower portions of which are symmetrical and express the actual vision in circles of diffusion. The upper portion of these curves on one side gives the area in which accommodation is involved. From this part of the curve the range of accommodation can be determined. Its inclination also varies with age. Both, in their relation to standard values for people of the same age, might serve as criteria for the degree of *Vergreisung* (aging).

P. C. KRONFELD.

Retina and Optic Nerve

MECHANICAL EXCITATION OF THE RETINA. M. L. ENRIQUEZ, Arch. de oftal. hispano-am. 33: 38 (Jan.) 1933.

The author recommends mechanical excitation of the retina by external pressure with a rod or with the finger, which normally provokes the production of phosphene, as a test for sensibility of the retina in cases (e. g., cataract) in which examination of the fundus is not practicable. When the retina is insensible (as in detachment) there is no production of phosphene. He considers this test much more delicate than the usual light test used in the functional examination of patients with cataract.

C. E. FINLAY.

COMPLETE RECOVERY IN CASES OF RETINAL DETACHMENT. PEREZ BUFILL, Arch. de oftal. hispano-am. 33: 215 (April) 1933.

This is a collection of clinical reports of cases of detachment of the retina in which Gonin's and Sourdille's methods were used with varying and mostly satisfactory results. The article is illustrated with fine colored drawings. The first case is especially noteworthy on account of the complete anatomic and functional restoration.

C. E. FINLAY.

RETINAL TEARS ANTEDATING DETACHMENT. K. VELHAGEN, JR., Rev. cubana de oto-neuro-oftal. 1: 369 (Nov.-Dec.) 1932.

Reference is made to the causal relation between detachment of the retina and retinal tears, to cases in which the tear was observed prior to the occurrence of the detachment, to possible permanent reapplication of the retina when occlusion of the retinal tear is incomplete and to the possibility of detachment not following the occurrence of a tear. The author reports a case of retinal detachment in which two consecutive detachments occurred but a tear was not found; the patient

was successfully treated by surgical diathermy (electrocoagulation). A tear was observed some days before the occurrence of a new detachment, which was treated by perforating electrocoagulation at the site of the tear, combined with eight nonperforating electropunctures placed about the tear; this was followed by a complete cure, which persisted two months after the operation.

The author holds that the tears preceding the two first detachments probably were not observed on account of the peripheral location, and that the tear preceding the last detachment cannot be attributed to the preceding operations.

Velhagen suggests combining in a single operation cauterization of the tear and closure of the danger zone by a series of electropunctures.

C. E. FINLAY.

ATYPICAL VASCULAR TUBERCULOSIS OF THE RETINA (PERIARTERITIS NODOSA TUBERCULOSA). W. KYRIELEIS, Arch. f. Augenh. **107**: 182, 1933.

There are two prevalent theories regarding the mechanism of the transportation of tubercle bacilli in the lymph sheaths of the retinal veins. Meller and his school believe that this juvenile form of retinal tuberculosis arises as a primary tuberculosis of the anterior uvea, whereas Axenfeld and others suggest that the bacilli emerge from the uninjured retinal capillaries and affect the retinal veins directly by penetrating their perivenous lymph sheaths.

The author cites a case in which there was a true periarteritis tuberculosa which could not have come from spread of the disease from a neighboring vein. He then reports a case of his own which followed trauma, and which supports the hypothesis that the tuberculosis came from a primary disease of the arteries. He draws the analogy between tuberculosis of the arteries and periarteritis nodosa (Goldstein, Isadore, and Wexler, David: The Ocular Pathology of Periarteritis Nodosa, ARCH. OPHTH. **2**: 288 [Sept.] 1929). Periarteritis nodosa, which is not caused by any specific toxin or bacterium, seems to arise as a local hypersensitivity of the wall of the vessel to repeated passage of some noxious agent through the lumen. The wall appears to acquire a local allergic state. The author regards tuberculosis of the retinal arteries as a somewhat similar condition due to the passage of live tubercle bacilli through the lumens of the vessels.

F. H. ADLER.

VISUAL ACUITY AND VISUAL FIELD IN REATTACHMENT OF THE RETINA FOLLOWING SURGICAL PROCEDURES. G. SALLMANN and K. SVEINSSON, Arch. f. Ophth. **130**: 1 (May) 1933.

The authors studied the functional results obtained in 101 patients with detachment of the retina who were operated on successfully at the second eye clinic of the University of Vienna; the original procedure of Gonin, the demarcation method with the potassium hydroxide stick (Guist) or the undermining operation of Lindner was used. The central visual acuity after reattachment of the retina depended mainly on the duration of the previous detachment. If the latter had not per-

sisted for more than three months, good vision could be expected. In cases of longer duration, normal or almost normal visual acuity was rarely obtained, although final vision of from 0.1 to 0.3 was not unusual after the detachment had lasted from five to eleven months. The prognosis was generally better if the visual acuity before operation was at least ability to count fingers and if not more than three operations were necessary to accomplish the reattachment. The extent of the detachment and the age of the patient had no definite influence on the functional outcome.

The central visual acuity in cases with tears in the macula was surprisingly good (table).

Central Visual Acuity

	Operative Procedure	Final Vision
Case 7	One ignipuncture	2/36, no Jaeger
Case 29	Use of potassium stick, after exposure of the posterior pole by modified Krönlein operation	6/18, Jaeger 3
Case 46	Same as preceding case	6/60, Jaeger 1
Case 47	Same as preceding case	3/36, Jaeger 6
Case 55	Undermining	6/60, Jaeger 4
Case 62	Undermining	6/60, Jaeger 7
Case 90	Undermining	Fingers at 2 feet
Case P. P.	Undermining	3/60

The question as to whether or not the operation in itself, if performed on a peripheral portion of the retina, had any bad effect on the macula (*Fernwirkung*, remote action) was interesting. In some of the patients treated with ignipunctures, such remote effects seemed to be present. After the application of potassium hydroxide, no remote effects on the macula were observed.

The recovery of the visual field after reattachment was more prompt and more extensive in cases of short duration of the detachment. This applied especially to the perception of blue. In some cases the process of recovery of the peripheral retina went on for years. The ignipuncture did much more permanent damage to the visual field than the treatment with potassium hydroxide. Repeated demarcation operations with multiple trephine holes in the same area also caused losses of field beyond the actual area of operation. If only one demarcation operation was necessary to accomplish reattachment, the function of the demarcated retina (the area peripheral to the line of demarcation) remained undisturbed in the majority of cases. The authors stress the point that a flattening out of the retina without actual reattachment—as can be produced by the wearing of pinhole-spectacles—leads to an increase in visual field.

P. C. KRONFELD.

DIATHERMY IN RUPTURES OF THE RETINA WITH DETACHMENT. H. J. M. WEVE, Klin. Monatsbl. f. Augenh. **89**: 683 (Nov.) 1932.

Weve gives a brief report on a new operative technic in detachment of the retina, devised and successfully employed by himself. It is based on localization by an accurate instrumental method (substitution method) and has less disadvantages and a larger scope of indications than Gonin's method. The penetrating cauterization by thermocautery or electrocautery is replaced by several micro-electrocoagulations, per-

formed with weak diathermic currents and a fine needle-shaped electrode, or by superficial coagulation with a blunt, buttoned electrode. This is done under constant control with the ophthalmoscope. The corneal contact glass facilitates the operation. Weve's results with this method were superior to those obtained by other methods. In ruptures with extensive detachments, the retina must be touched directly by the cauterization and attachment obtained by this procedure. K. L. STOLL.

DIATHERMY IN RUPTURES WITH DETACHMENT OF THE RETINA. H. J. M. WEVE, Klin. Monatsbl. f. Augenh. **89:** 822 (Dec.) 1932.

Operative procedure with diathermy has been used with good results at the University Eye Clinic at Utrecht for three years. Too slight coagulation must be avoided, and one sufficient operation is preferable to repeated slight coagulations. Exact localization of the retinal tear is essential. Recurrences of detachment could be traced repeatedly to a spot which had been considered "suspicious" of a rupture prior to, or during, the first operation. Individually varying sensitiveness to diathermy may produce severe symptoms of anaphylaxis, especially in eyes which previously had been treated with heat. This was observed twice in one hundred operations with diathermy. Repeated operations with diathermy have caused a hemorrhage in the scar left by a perforation made by Gonin's method in one case, and from the blood vessels in the disk in another.

The after-care consists of rest in bed for two weeks, except in old people, with a binocular bandage during the first twelve days and Lindner's spectacles (*Lochbrille*) afterward. Protracted use of atropine is recommended on account of the etiologic rôle possibly played by accommodation and contraction of the ciliary muscles.

About one half of the fifty-five cases in which diathermy was used in 1932 were acute and uncomplicated; the remainder were subacute or chronic and unfavorable. Permanent cure was obtained in 60 per cent of all these cases, and in 85 per cent of twenty-eight the duration of the detachment was less than two months. Cures were obtained in 33 per cent of the cases in which the detachment was of more than two months' duration; operation had been performed previously or there were complications in one third of the cases. The operation was successful in all of sixteen cases with ruptures in the ora serrata. The various types and stages of detachment of the retina require special forms of treatment. K. L. STOLL.

Trachoma

INOCULATION OF THE HUMAN CONJUNCTIVA WITH TRACHOMATOUS MATERIALS. P. THYGESON, Am. J. Ophth. **16:** 409 (May) 1933.

The author discusses the communicability of trachoma, and gives the following summary and conclusions.

"Trachoma was produced experimentally in the normal human eye as the result of inoculation with materials from an active case of the disease. Acute symptoms developed in the inoculated eye after an incubation period of six days. In twenty-six days the uninoculated eye

became involved. Minute bacilli were observed in films made from the original material and in films from the experimental disease, and two types of minute bacilli were recovered in culture. They resembled Bacterium granulosis in certain respects but could be differentiated from it morphologically and culturally. They were without pathogenicity and probably were saprophytes derived originally from the air. The inclusion bodies of Prowazek and Halberstaedter were characteristic of the experimental disease."

W. S. REESE.

THE CONTAGIOUSNESS OF TRACHOMA: THREE NEW CASES OF DIRECT CONTAGION; PHYSICIANS INFECTED BY THEIR PATIENTS FOLLOWING OPERATIVE ACCIDENTS. CUÉNOD and ROGER NATAF, Ann. d'ocul. **170:** 78 (Jan.) 1933.

In view of the present tendency to regard trachoma as less contagious than it was formerly thought to be, the following report before the Ophthalmological Society of Paris in October, 1932, is of interest.

Cuénod and Roger Nataf of Tunis reported the accidental inoculation of three of their confrères with trachoma in an identical manner in the course of operative procedures, that is, after the accidental entry of trachomatous material into their eyes. These three cases constitute real laboratory experiences and bring three new cases of absolutely indisputable direct contagion to one's notice.

In comment, Morax stated that because these accidental inoculations were real experiences, they were of great interest.

S. H. MCKEE.

CLASSIFICATION OF TRACHOMA. V. V. CHIRKOWSKY, Sovet. vestnik oftal. **2:** 337, 1933.

The author is a follower of the dualistic theory of the trachomatous process being a separate infectious disease. He bases his classification of trachoma on both the clinical features of the process in its development and the pathologic changes in its various stages. To the first stage of trachoma belong all incipient and more severe progressing cases of deep infiltration of the conjunctiva, with follicle formation on the latter and at the fornices. Clinically, this stage is demonstrated in the thickening of the conjunctiva, with an occasional involvement of the cornea. The dominating feature of the second stage, or trachoma II, is the regression of the process. There are degeneration of the follicles and the beginning of replacement of the inflamed tissue by cicatricial tissue in the form of fine scars. Side by side with the regressive changes there are still present infiltration of the conjunctiva and follicle formation. Clinically, this stage is characterized by the gelatinous appearance of the conjunctiva. The upper part of the tarsus is thickened and uneven and has degenerative changes in it. The follicles have little resistance to mechanical manipulations. Trachoma III is the stage of cicatrices on a large scale. At times follicle formation and infiltration of the conjunctiva are observed simultaneously. This period is abundant, with various complications, such as trichiasis, entropion, corneal ulcers and symblepharon. The fourth stage is noncontagious, the formation of scar tissue being completed without complications.

There is a separate group of trachoma dubium in which no deep infiltration of the conjunctiva is observed. These cases must be observed for a certain period in order to make the proper diagnosis.

The author believes that acute trachoma occurs exceptionally rarely. In these cases the trachomatous process is obscured by the catarrhal symptoms which are caused by definite micro-organisms established on bacteriologic examination.

O. SITCHEVSKA.

Tumors

CYSTS OF THE IRIS. VILLARD and DEJEAN, Arch. d'opht. **50:** 91 (Feb.); 194 (March); 272 (April) 1933.

This is an exhaustive review of the subject instigated by the authors' observation of a personal case. They have reviewed 230 references, which are included in their bibliography. These cases are usually classified in four large groups—traumatic, parasitic, spontaneous and congenital. Although traumatic cysts and parasitic cysts are more common, the authors devote the greater part of their presentation to the latter two groups. The former have been extensively studied, whereas the latter are subject to some confusion.

Traumatic cysts are subdivided clinically into "pearl" cysts and serous cysts. The serous cysts are again separated, depending on whether they are epithelial (ectodermic) or endothelial (mesodermic). These three types are described in some detail, with accompanying illustrations taken from the literature.

Parasitic cysts are briefly discussed and illustrated.

Spontaneous acquired cysts are those not of traumatic, congenital or parasitic origin. They have been described as simple, serous or acquired cysts. The authors suggest an anatomic classification and divide them into retention cysts, adherent cysts, cysts due to reduplication of the posterior epithelium and wandering cysts.

Retention cysts may be due to the blocking of a lymphatic in the iris stroma or to the shutting off of a crypt from the surface of the iris. Another form may be the result of a cleavage between the stroma and the pigmented epithelium.

Adherent cysts are due to the accidental closure of the anterior or posterior chamber by union of part of the iris or of exudate from the iris. They are similar to traumatic cysts, except that no trauma has occurred. It is largely a question of synechiae.

Epithelial reduplication cysts develop between the two layers of the posterior epithelium of the iris. Many have been reported.

Wandering cysts are freely movable cysts in the anterior chamber. The mode of development is not well understood, but their origin from the iris does not seem to be doubted.

The second instalment of this study deals solely with congenital cysts. They are extremely rare. In 1906 Lagrange was able to find only six reports in the literature up to that time. Since then ten other cases are reported. These are briefly reviewed. The authors' case is fully described. It concerns a woman, aged 39. When 14 years old she first consulted an ophthalmologist, who gave her intramuscular injections of mercury. Later she consulted two other ophthalmologists, who were no more successful in their treatment. Her mother had suffered

from a condition of the eyes similar to her own. Externally, both eyes appeared normal. The lesions were similar in each. Both pupils were found more or less completely filled with brownish globular masses which appeared to be attached to the posterior surface of the iris. Their position changed with the position of the head, and when the head was moved violently, they shook like a cluster of bells. The tension of each eye was normal. Visual acuity varied between 0.5 and 0.6 and was not improved by glasses. Clinical examination, including a Wassermann test, gave negative results. A careful slit-lamp examination is recorded. By this means the authors determined definitely that the masses arose from the posterior surface of the iris.

The authors subdivide congenital cysts into three groups: (1) inclusion cysts, (2) cysts due to cleavage of the anterior layers and (3) cysts due to cleavage of the posterior layers.

Inclusion cysts are due to the accidental shutting off in the stroma of an epithelial bud in the course of development. This may form simple cysts or dermoids. Cysts caused by the separation of the anterior layers are probably due to the retention of fluid in the meshwork of the iris. Cysts due to cleavage of the posterior layers are fully discussed. The embryologic development of the iris is briefly reviewed, especially from the point of view of the annular sinus. The authors suggest the probability that this type of cyst is more often due to the persistence and abnormal development of this sinus.

The third part deals with the diagnosis, prognosis, course and treatment in these cases. The authors point out the importance of a careful history and emphasize especially the value of examination with the slit lamp. In discussing the differential diagnosis, a number of conditions must be considered. These include leukosarcoma, syphilitic gumma, tuberculosis, leprosy and benign tumors. The differentiation of the various types of cysts is also discussed.

In general, cysts of the iris pass through three rather definite stages clinically. The first is a symptom-free period, the second is characterized by iridocyclitis, and the third is characterized by absolute glaucoma.

Treatment should be instituted early. Surgical treatment which accomplishes the complete removal of the cyst by means of an iridectomy is the most satisfactory. When conditions are unfavorable for this method, other means which have been used with success can be tried. The most promising nonsurgical procedure seems to be electrocoagulation.

A complete bibliography is appended. One should read the original article to appreciate its value.

S. B. MARLOW.

DIAGNOSTIC DIFFICULTIES IN METASTASES OF CARCINOMA IN THE GLOBE: REPORT OF CASES. B. DIMISSIANOS, Klin. Monatschr. f. Augenh. **89**: 356 (Sept.) 1932.

The seat of an intra-ocular metastatic carcinoma is usually the posterior portion of the uveal tract, rarely the ciliary body and iris; probably none has ever been found in the retina, except when a carcinoma of the choroid involved the retina and the disk secondarily. The author adds 3 cases of metastatic carcinoma of the uveal tract to the 132 cases

known in the literature. The first and third cases were in women who had had breasts amputated for carcinoma. The second case was one of those in which the first symptoms occur in the eye at a time when no suspicion of carcinoma elsewhere exists. The fourth woman suffered from melanocarcinoma of the parotid gland and an apparently independent spindle cell sarcoma of the choroid.

K. L. STOLL.

LATE DEVELOPMENT OF GLIOMA OF THE RETINA. A. L. WOSNESENSKAYA, Sovet. vestnik oftal. **2**: 202, 1933.

This case is reported (1) because of late development of the tumor, the patient's age being 20, (2) because of the location of the neoplasm between the sclera and the uveal tract and (3) because the histologic changes were typical of a mature neoplasm.

There were observed under the microscope, side by side, cells of undifferentiated epithelium, astrospongioblasts and astrospongiocytes, with transition into normal astrocytes with vascular foot processes. Clinically, there was ectasia of the eyeball on the temporal side, with a complicated cataract. Exenteration of the orbit followed the histopathologic observations.

O. SITCHEVSKA.

Uvea

HETEROPLASTIC OSSIFICATION IN THE CHOROID. T. M. SHAPIRA, Am. J. Ophth. **15**: 721 (Aug.) 1932.

Two cases of ossification of the choroid are described.

In the first case there was a history of perforating injury to the right eye followed by immediate blindness, and subsequently three attacks of increased tension. There was an almost complete intra-ocular wall. The lens, the ciliary body and the retinal stalk, in addition to the choroid, were invaded.

The second case was one of glaucoma with typical phthisis bulbi of the right eye as a sequela, in a man, aged 71. The ossification process involved areas of the choroid.

The following conclusions are formed:

Bone formation results after years of continued inflammation. Bone may be found in the retina, in the cyclitic membranes, in the lens, in the iris and in the ciliary body, as well as in the choroid.

The reason that bone formation takes place in the choroid is because of its great vascularity. Whether or not calcification precedes heteroplastic ossification is still an open question.

Illustrations and a bibliography accompany the article.

W. ZENTMAYER.

PATHOLOGY AND THERAPY OF CYSTS OF THE IRIS. E. CUSTODIS, Klin. Monatsbl. f. Augenh. **90**: 361 (March) 1933.

The author gives a detailed account of the literature on the pathology and therapy of cysts of the iris and reports the case of a man, aged 28, in whom a small cyst of the iris located in the angle of the chamber developed after an apparently nonperforating injury. The giant magnet,

roentgenograms and the sideroscope gave no evidence of the presence of a magnetic foreign body following the injury. The irritation disappeared promptly, but the patient returned a year later with a large cyst of the iris occupying the entire nasal half of the anterior chamber. Repeated punctures of the cyst and irradiation with radium and roentgen rays failed to produce more than transient results. The anterior chamber was opened by a scleral incision and the bag of the cyst was grasped by a forceps and pulled beneath the conjunctiva, which was closed by a suture. When this operation proved to be futile, roentgen rays were used, with final success; 80 per cent of an erythema dose was applied in two sittings at a distance of 30 cm., through a copper and aluminum filter. No opacification of the lens occurred during the next sixteen months; the cyst did not recur, and vision was normal.

The experience in this case and the results recorded in the literature prompt Custodis to issue a warning against all operative procedures in posttraumatic epithelial cysts unless total extirpation is attempted. Should operative extirpation be impossible, or fail, radiation must be resorted to. Possible damage from radiation seems less dangerous, in the author's opinion, than to risk the development of glaucoma as a consequence of proliferation of the epithelium in the anterior chamber.

K. L. STOLL.

THE HEALING OF TUBERCULOUS LESIONS OF THE EYE AND OF THE BRAIN STEM. L. HEINE, Ztschr. f. Augenh. **80:** 209 (May) 1933.

The author presents records of cases of tuberculosis of the eye in the form of nodular iritis, disseminate choroiditis and solitary tubercle of the retina and of the choroid showing a tendency of the lesions to heal. Patients were observed over a long period. He cites similar cases described in his book "Die Krankheiten des Auges" (Berlin, 1921).

Heine states that tuberculosis of the eye in the forms mentioned may be diagnosed with a considerable degree of certainty from the clinical appearances. In iritis, the more rapidly the nodule forms and the more its color approaches reddish yellow, the more frequently is the lesion of syphilitic origin; the slower the development of the nodule and the more it resembles gray glass, the more often is tuberculosis to be suspected. The seat of the nodule in the iris, at the pupillary margin, in the midstroma or at the root of the iris has no causal significance. Tuberculous nodules may be simulated by certain cysts of the iris which result from separation of the posterior pigment layer of the iris and which are often of inflammatory origin. Unlike tuberculous nodules, they tend to come and go and to recur in the same place.

In the choroid, if the lesion is solitary or disseminate, tuberculosis is probable, whereas if it is diffuse in the form of chorioretinitis, syphilis is the more likely cause. Disseminate choroiditis results from repeated metastases by way of the blood stream from a distant and oft unrecognizable source of tuberculosis. If the lesions coalesce, a diffuse chorioretinitis may be simulated, but it is characteristic of the tuberculous form that it spreads from a center (macula) in various directions. The continuity of the lesions is maintained. If healing does not occur, large tuberculomas may form which may easily be mistaken for malig-

nant growths, and only a microscopic examination after enucleation will reveal the tuberculous etiology. However, healing of disseminate choroiditis is the rule.

While the retina may be secondarily involved from the choroid, the inner layers of this structure primarily may be affected with a hematogenous tuberculous infection in either of two clinical forms: 1. Angiopathic retinal tuberculosis in which gray glass nodules may occasionally be seen in the walls of the vessels, or only the resulting changes may be observed, such as changes in caliber, closure of the vessels, new vascular formation and anastomoses and glomerular structures. The recurrent vitreous hemorrhages of otherwise healthy young adults belong in great part to this angiopathy. 2. The solitary tubercle of the retina, which is similar to the solitary tubercle of the brain and heals more frequently than might be expected.

The author states further that as a cause for certain symptoms associated with lesions of the cerebral pons, namely, paralysis of the abducens nerve, conjugate paralysis and paralysis of the abducens and facial nerves, often combined with symptoms of a one-sided character, tuberculosis must be first considered. When these symptoms, particularly in children or in young persons, subside spontaneously or with treatment, tuberculosis may be assumed as a cause with much certainty. The author records three cases of this character.

H. L. BEGLE.

Vision

TWO CIRCLE GRID CHARTS FOR MEASURING VISUAL ACUITY AND ASTIGMATISM. E. H. GREENE, Am. J. Ophth. **15:** 716 (Aug.) 1932.

A list of variable factors in the test for visual acuity was used as the basis for drawing specifications for a series of ideal test objects. A study of current forms revealed the fact that the circle grid was the only test object which met all ten specifications. Two charts were devised, one for 6 meters and one for 30 cm. These charts seemed to have the following advantages: They give accurate records of visual acuity and the approximate axis of the astigmatism, simultaneously. This is important because when astigmatism is present it affects the resolution of any symbols used. The circle grid is the only symbol graded for astigmatism at the various distances, and astigmatism is most clearly shown at the point of questionable resolution.

The charts are scarcely affected by a difference in the mental ability or language training of the patients, or by inequalities among the test objects themselves. They are easy to administer and score. The average person of the mental age of 4 years can be trained to use the charts in about one minute. They give a reliable measurement of both distant and near vision without changing the type of test objects or the directions.

W. ZENTMAYER.

RESEARCHES IN SEEING. M. LUCKEISH, Am. J. Ophth. **15:** 801 (Sept.) 1932.

This article does not lend itself well to abstraction. The author points out that researches in vision have yielded much of value in the

development of a science of seeing, but researches in seeing have been relatively rare.

Quantity of light is the most obvious, most universally applicable and, in the present primitive stage of artificial lighting, most influential means for improving seeing conditions. The emphasis placed on the importance of quantity of light as an aid to seeing involves the assumption that the lighting is accomplished with the minimum amount of glare and other negative influences.

The article is illustrated and has a bibliography.

W. ZENTMAYER.

CONGENITAL READING DISABILITY—STREPHOSYMBOLIA. L. L. MAYER, J. A. M. A. **100:** 1152 (April 15) 1933.

The author reviews the literature on strephosymbolia and reports three cases. In all the cases it was demonstrated that the center of auditory memory was entirely normal. This factor was used as an adjunct in teaching children with this condition. Travis' statement that handedness is the sine qua non of laterality would not seem to be borne out by these cases; neither is it evident that Gould's explanation that eyedness is determined by defects in one eye which cause the other to become dominant would apply in such cases. From a perusal of this small group of cases, weight is added to Orton's statement: "The master eye has been held by some to be a safer guide to native dominance than the master hand." The fact that early training may reverse the master hand while no amount of training has been able to change the master eye would seem to enhance the importance of determining eyedness. Histopathologic changes in the center for speech have not been studied in this type of case but may in the future reveal an anatomic foundation for the difficulty.

The author draws the following conclusions:

In five cases of acquired, congenital and partial word blindness (strephosymbolia), ocular dominance has been the outstanding feature.

It is important to determine the dominant eye; this knowledge is of value to the ophthalmologist and to the patient.

It is hoped that, by bringing such a condition to the attention of the ophthalmologist, a saner regard for children with partial word blindness will be stimulated and thus the stigma of being called "mental defectives" will be lifted from them.

W. ZENTMAYER.

APHAKIC STEREOSCOPIC VISION, WITH A NOTE ON THE SYNOPTOPHORE. J. FOSTER and A. S. JACKSON, Brit. J. Ophth. **17:** 98 (Feb.) 1933.

In order to determine the amount of stereoscopic vision in aphacia the following tests were applied in ten bilateral cases: (1) Worth's "four light test," (2) Maddox rods and (3) the synoptophore.

Three patients had good stereoscopic vision, two had good stereoscopic vision with prisms, one had simultaneous perception with prisms and one had intractable diplopia. The conclusions seem to be that if glasses are fitted with sufficient care, it is worth while removing a second cataract to try to obtain stereoscopic vision, if this would assist a patient in his mode of living.

It is essential that the patient should have had stereoscopic vision before the lenses become opaque, and that there should be no obvious lesion of the extra-ocular muscles, if stereoscopic vision is to be expected after operation.

W. ZENTMAYER.

DUPLICITY OF THE VISUAL ORGAN IN NATURE AND EXPERIMENT. N. BLATT, Miscarea med. **6:** 195, 1933.

As experimental biology has cleared up the matter of the duplicity of visual organs, one now knows that even if such malformations are assumed to be due to the coalescence of two embryos, an important part devolves on the increased regenerative activity of the embryonic cells. This activity can lead to the development of supernumerary eyes. At any rate, it is noteworthy that malformations of this kind are especially found in animals the regenerative activity of which is still great in adult life.

In higher classes of animals, duplicity of the eyes derived from an increase in the regenerative power in embryonal life is one of the rarest occurrences. However, should this happen, it would be possible to explain it in the same manner as in amphibians.

Duplicity of the visual organ in amphibians can also be produced experimentally, the embryo being cultured from the one-cell stage to its maturity in water to which various chemical substances such as alcohol, chlorates, magnesium salts and various acids have been added.

If by the chemical decomposition of the culture medium, for instance, that part of the brain of the embryo is injured from which the eyes would originate, then the adjacent embryonic cell can be induced by exceeding regeneration to develop the eye, thus giving rise to the formation of not only two, but three or even four, eyes. An increase in regeneration may begin, too, after experimental excision of individual groups of embryonic cells. But if part of another embryo with two optic anlagen is substituted for the cut-off part, this may give rise to duplication of the visual organ.

If a piece of the medullary plate with one optic anlage or a smaller piece of the roof of the archenteron is transplanted into the cephalic end of a neurula, triophthalmos may develop in the adult animal; if a medullary plate with two optic anlagen or a larger piece of the roof of the archenteron is transplanted, quadrophthalmos forms.

Amphibians are best fitted for these exceedingly difficult experiments destined to generate a quadrophthalmic animal.

From the histologic picture of monstrosities of this kind, it appears distinctly that all four eyes are completely developed, because they possess all of the three membranes of the eye—the retina, choroid and sclerotic—as well as a normal lens.

Artificial experimental interference with a view to producing duplicity of the visual organs is best performed in the neurula stage in which the medullary folds are just arising and a vestige of the neural plates, too, can already be perceived on both sides.

The formation of the lens in the eyes of the amphibian shows that duplication of the visual organ can be partial and that it can be produced experimentally.

In man, too, a slight tendency to partial duplication of the eye is found, namely, in the extremely rare cases in which a double lens is found in one eye.

N. BLATT.

Vitreous

CONCERNING A MEMBRANE BETWEEN THE VITREOUS AND THE ANTERIOR CHAMBER, SEEN AFTER REMOVAL OF THE CRYSTALLINE LENS AND ITS CAPSULE. A. COWAN, Am. J. Ophth. **15:** 125 (Feb.) 1932.

The author describes a thin homogenous membrane separating the aqueous and vitreous which is seen following intracapsular extraction of the lens. This can be observed as early as the fifth day after operation, bulging forward into the anterior chamber through the pupillary space. The membrane retracts until it becomes concave from before backward. Behind it is a distinct, clear space which corresponds to the retrolental space of a normal eye. The author believes that this is not a condensation of the vitreous but a distinct, homogeneous, hyaloid membrane.

W. S. REESE.

HOLES IN THE "POSTERIOR HYALOID-MEMBRANE" OF THE VITREOUS: REPORT OF A CASE. J. R. ANDERSON, Brit. J. Ophth. **17:** 460 (Aug.) 1933.

The patient was a married woman, aged 30, who appeared to be exceptionally healthy, robust and free from septic foci. Her only illness had been a serious, though obscure, upset during the first few years of life. With a + 9 D. sph., a delicate vertical membrane was visible in the left vitreous with a central aperture through which the optic disk could be clearly seen. This aperture was 1.5 disk diameters, but six months later it had definitely increased in size. Temporal to it there was a much larger circular hole which was tilted so that its nasal margin was seen with + 7 D. sph. and its temporal edge, which was almost in contact with the retina, was in focus with a —4 D. sph. In the temporal periphery lay several indistinct white retinal foci, and in front of one of these and still partially connected with it lay a smaller annular opening, while toward the nasal periphery lay several clusters of smaller holes. The vitreous was clear except for fine dust and the membrane which obscured the retinal vessels where not seen through apertures. Examination of the vitreous of the other eye was difficult owing to the presence of a secondary postcortical cataract, which had caused loss of vision during a period of eighteen months, but it was possible to see, through the semi-opaque lens, a central aperture in the vitreous similar to that in the left eye. Biomicroscopy of the "hyaloid" membrane was difficult because of its posterior situation. It appeared to be situated one and a third lens diameters (anteroposterior) behind the posterior surface of the lens. The edge of the aperture was bright in direct illumination, and the surface of the membrane was gray and covered with scattered spots. No structure was discernible within the aperture. This could be accounted for by transparence of the fluid lying between the membrane and the retina. Owing to the posterior situation of the membrane, it could be seen only when

the axes of the microscope and the slit lamp almost coincided with the optical axis of the eye. If the axis of the incident light was oblique, numerous fine white vitreous strands were seen as well as numerous dots lying immediately behind the lens. The lens of this eye showed typical iridescence and fine posterior cortical opacities. The lens of the other eye showed more advanced opacification and marked iridescence, and the cornea showed extensive endothelial bedewing. Reference is made to similar central apertures in myopia and the senium and to eccentric and more irregular openings after retinochoroidal disease. As a sequel to some preexistent morbid process, the vitreous shrinks and becomes detached from the retina. This separation may tear a thickened posterior limiting membrane which is a product of disease and may become thicker when detached. Through such a tear clear fluid passes to fill the space behind the vitreous. The membrane may contract and form opacities which float in the degenerate vitreous. It may, by tearing the retina, play some part in the evolution of one type of retinal detachment.

W. ZENTMAYER.

Therapeutics

EXPERIMENTAL STUDIES IN DIATHERMY APPLIED TO THE EYE AND ORBIT: COMPARISON OF THERMAL EFFECTS OF DIATHERMY, INFRARED RADIATION AND ELECTRIC HEATING PAD. W. F. MONCREIFF, J. S. COULTER and H. J. HOLMQUEST, Am. J. Ophth. **16:** 193 (March) 1933.

This is the second of a series of studies. The authors give the following summary and conclusions: "Studies of radiant heat by means of infra red rays and of conduction heat by means of an electric resistance heating pad, applied to the eye and orbit in narcotized dogs, were made for comparison with studies of diathermy previously reported.

"Comparison of the results demonstrates that the skin and superficial tissues tolerate the diathermy currents to a maximum of 600 ma., and also the infra red radiation, better than conduction heat from the electric resistance heating pad, so that a greater input of energy and consequently a greater rise of temperature are produced by diathermy than by either of the other two methods, and by infra red radiation than by conduction heat from the electric heating pad. It is significant that even in the anterior zones the heating power of diathermy, within the limits of skin tolerance, is greater (about 2.0° C.) than that of infra red radiation, and much greater (about 4.0°C.) than that of the heating pad."

W. S. REESE.

MYDRIATIC SYNERGY. A NOTE ON THE USE OF MYDRIASIS BY SUBCONJUNCTIVAL INJECTION. F. FLYNN, Brit. J. Ophth. **17:** 298 (May) 1933.

The solution employed contains, in each 5 minim (0.3 cc.) dose, atropine sulphate $\frac{1}{60}$ grain (0.001 Gm.), cocaine hydrochloride $\frac{1}{10}$ grain (0.006 Gm.), and levorotatory epinephrine hydrochloride $\frac{1}{600}$ grain (0.0001 Gm.), together with sodium chloride $\frac{1}{80}$ grain (0.0008 Gm.) and chlorbutanol $\frac{1}{120}$ grain (0.0005 Gm.) in sterilized water. The term "mydricain" is suggested for the solution.

A few drops of cocaine solution are first instilled. The injection is given a few millimeters from the limbus at the apparently most resistant part of the pupil—for example, where there is an obvious synechia.

The use of this solution is indicated when a powerful mydriasis is desired, and when folliculosis and dermatitis develop following the instillation of atropine into the conjunctival culdesac.

W. ZENTMAYER.

ROENTGEN TREATMENT IN PARENCHYMATOUS KERATITIS. F. GNAD, Klin. Monatsbl. f. Augenh. **88:** 685 (May) 1932.

A comparison of the cases of patients with parenchymatous keratitis who were treated at the eye clinic of Elschnig with roentgen rays with those of patients not treated in this manner showed an abbreviation of the course in some instances of the acute stage. Prompt recovery, however, has also been observed in patients who were not exposed to roentgen rays. Reliable results were not obtained by Gnad, nor are they evident in the publications of other authors. Roentgen treatment, therefore, is not indicated in parenchymatous keratitis. K. L. STOLL.

Toxic Amblyopia

TOXIC AMBLYOPIA AND ACCOMPANYING PHYSIOLOGICAL DISTURBANCES IN CARBON TETRACHLORIDE INTOXICATION. ZOLTON T. WIRTSCHAFTER, Am. J. Pub. Health **23:** 1035 (Oct.) 1933.

Five cases of poisoning with carbon tetrachloride are reported. In all of them there was a concentric contraction of all the color fields without any central scotomas. Unfortunately no records of the visual acuity are included in the report. When the patients were removed from exposure to carbon tetrachloride and placed on a diet high in calcium and dextrose the amblyopia rapidly disappeared.

F. H. ADLER.

Society Transactions

EDITED BY DR. JOHN HERBERT WAITE

FOURTEENTH INTERNATIONAL OPHTHALMOLOGICAL CONGRESS

K. VELHAGEN, M.D., Halle, Germany, *Reporter*

Madrid, Spain, April 16-23, 1933

TRANSLATED BY PERCY FRIDENBERG, M.D., New York

(Concluded from p. 565)

SYMPOSIUM ON TRACHOMA

This symposium was conducted in connection with the meeting of the International Association for the Prevention of Trachoma.

WELCOMING ADDRESS BY THE PRESIDENT. DR. E. VON GROSZ, Budapest, Hungary.

Dr. von Grosz gives a brief review of the origin and history of the association. The Hungarian prize for the best treatise on the etiology of trachoma was awarded by the judges' committee, consisting of Morax, McCallan, Maggiore, Prausnitz and von Grosz, equally to Taborisky and Ugo Lombroso. The problems of the organization have so far been insoluble, and there are many obstacles to be overcome. With improvement in the world economic condition and increased means, the organization hopes for better prospects. Election of a new president is to take place in 1935.

SIGNIFICANCE OF THE GENERAL CONSTITUTION IN TRACHOMA. DR. MCCALLAN, London, England.

Dr. McCallan studied the general constitution in individual patients and in groups in order to determine its influence on susceptibility to infection after contact with patients with trachoma and on the virulence of the disease if infection took place. Trachoma is a specific, contagious disease of the conjunctiva, having a chronic course and invading the cornea. It is characterized by cell proliferations, the subepithelial follicles, which have a tendency to be replaced by cicatricial tissue. Constitution signifies the physical nature, or the character of the body in regard to health, strength and vital energy, and also the aptitude of the defensive mechanism of the body as a whole, by means of its humors and cells, to resist the entrance of pathogenic micro-organisms and of viruses. No race is immune to trachoma, although susceptibility to infection increases under certain conditions of the surroundings (geographic, climatic and habitational) and in intercurrent disease.

These factors, as well as the influence of sanitation, are discussed in detail. In the course of twenty years of professional activity in Egypt, Dr. McCallan was unable to find any relationship to susceptibility except for the factor of surroundings (*Umwelt*) in its widest sense. Egyptians of the higher classes have their children cared for by trachoma-free nurses, and accordingly trachoma is rarely observed among them. Trachoma is especially unfavorably influenced by Ancylostoma duodenale, Schistosomum haematobium, focal infections and tonsillitis. The theory of Angelucci and others that lymphatic dyscrasia and adenoidism play an important part in the etiology must be characterized, categorically, as untenable. Brandes has insisted, correctly, that what Angelucci described was follicular conjunctivitis, not trachoma. The differential diagnosis is confirmed by the finding of pannus on slit-lamp examination.

RÔLE OF THE GENERAL CONSTITUTION IN TRACHOMA. DR. ARNOLDO ANGELUCCI, Naples, Italy.

Dr. Angelucci does not deny that a micro-organism or a filtrable virus may play a part in trachoma, but, if so, it takes effect on a specially predisposed and hence susceptible terrain or soil represented by a lymphatic or adenoid systemic disturbance. The local disease is a part, and an expression, of an individual lymphadenoid constitutional disturbance. Dr. Angelucci supports this thesis with a wealth of factual data and considerations on the general nature of lymphatism, discussing in detail peculiarities of metabolism, body structure and internal secretions and the rôle of the autonomic nervous system. He also analyzes a copious amount of clinical material in his own experience and that of others and considers the factors of heredity, social conditions, environment and, finally and in extenso, the significance of cutaneous pigmentation and its relation to the resistance capacity of the person.

MICROBIOLOGIC ETIOLOGY OF TRACHOMA. DR. V. MORAX, Paris, France.

Dr. Morax reports the results of bacterioscopic examination of tissue sections. Examination of the conjunctival secretion is essential for clinical purposes on account of mixed and secondary infections, but it has not solved the problem of etiology. The inclusion bodies are considered in detail, as to history, various manifestations, forms, and so on. Dr. Morax is frankly skeptical as to the claimed identity of trachoma with inclusion blennorrhea, swimming-pool conjunctivitis (and Samoan conjunctivitis and swine pest). He believes that the existence of inclusion bodies and their parasitic nature can no longer be doubted but that their rôle in the causation of trachoma is still purely hypothetic.

ETIOLOGY OF TRACHOMA FROM THE MICROBIOLOGIC STANDPOINT. DR. G. PITTALUGA, Madrid, Spain.

Dr. Pittaluga considers three hypotheses possible at the present time: 1. The specific inciter of trachoma is Bacterium granulosis of Noguchi. 2. The inciting organism is an ultravisible virus. 3. Bact. granulosis is the germ of origin or the carrier of the ultravisible

virus. Dr. Pittaluga discusses in detail the clinical and bacteriologic data which have been presented up to the present time and their interpretation by various authorities and comes to the conclusion that the question of the etiology of trachoma cannot be settled on a purely microbiologic basis. The alimentary and constitutional factors must also be taken into consideration. Trachoma is a deficiency disease caused by misery and hardship, which develops in constitutionally defective subjects or in those who are weakened by undernourishment or in whom a lymphatic diathesis favors the development of germs, whether specific or not, in a conjunctiva which has been previously damaged by other physical factors. Bact. granulosis probably plays a rôle in the pathogenesis of trachoma.

MICROBIC ETIOLOGY OF TRACHOMA. DR. P. THYGESEN, Washington, D. C.

The assumption that trachoma is the result of repeated infections with ordinary bacteria is in contradiction with the clinical facts. Noguchi's bacillus was found by many subsequent investigators but few of them drew, in regard to it, the same conclusions as Noguchi. In animals it produced on inoculation the same clinical picture as that following vaccination with trachoma material, but this picture did not sufficiently match that of trachoma in human beings. One is not yet in a position to make a positive and unmistakable diagnosis of trachoma in experimental animals. Dr. Thygesen has also found the small bacilli of Lumbroso (Tunis). Further investigation must be awaited. So far, the pathologic significance of these organisms has not been proved. In fact, at the present time, one cannot say with sufficient probability that any micro-organism is the specific exciter of trachoma. An ultravisible virus is the most likely cause.

INITIAL STAGES OF TRACHOMA. DR. WIBAUT, Amsterdam, The Netherlands.

Dr. Wibaut studied the data furnished by a questionnaire which was answered by many ophthalmologists of various lands. In countries in which trachoma is endemic, the diagnosis is made before the appearance of complications or the formation of cicatricial tissue. In certain cases there is a lack of accord, some physicians diagnosing the condition as "benign" trachoma, and others, as follicular conjunctivitis. Most reporters consider that there is no doubt of the existence and importance of an original, initial and uncomplicated trachoma. These uncomplicated forms are seen frequently in children and appear even at preschool age. They can be found if one looks for them in the schools, homes and kindergartens, instead of expecting the patients to come to the clinics. These noncomplicated forms retain their special character for a long time if correctly treated, even in the most severely plagued countries. From the statistical data it is evident that childhood offers an extraordinarily important point of attack and the most favorable prospect in the systematic combating of trachoma. Instead of closing schools and kindergartens to children with trachoma, one must try to treat them in these very centers.

POSITION OF TRACHOMA IN THE GRANULOMA GROUP. DR. E. KRUECKMANN, Berlin, Germany.

Trachoma is characterized, clinically, by gelatinous degeneration and cicatricial changes. The former process has not been sufficiently explained histologically. The formation of cicatricial connective tissue starts principally in the cells of the walls of the vessels. The elective localization in the conjunctiva, carrying muscle cells, expresses itself mainly in a submucous proliferation which may develop into a massive adenoid structure with follicles. The only justifiable registration is under specific granuloma if by that term is understood an inflammatory neoformation, and this may not hold good in the primary stage. The cells of the adventitia develop fibers which girdle the granulous nuclei, predominantly from without. The vessels in the interior take little part in this process. In this way a covering layer is produced which has the appearance of cicatricial tissue. Necrotic foci are less prominent than diffuse degenerations. The usual granulation tissue with neoformation may extend to structures which do not lie within the granulous nucleus (corneal pannus and small vascular islands in the conjunctiva).

DISCUSSION

DR. F. ALDAVE, Goyanna, Brazil: Trachoma is a specific disease of the reticulo-endothelial structure of the conjunctiva, characterized by infiltration with cellular elements of a reticular nature and by the formation of follicles and granulomas.

A NEW METHOD FOR THE TREATMENT OF TRACHOMA. DR. A. GARDILCIC, Zagreb, Jugoslavia.

Dr. Gardilcic reports excellent results from the use of a new chemicotherapeutic product which cures trachoma quickly and completely, so that there are no relapses, by a simple treatment of short duration. A wealth of illustrations is presented to show the results of treatment. This medication is also effective in scrofulous diseases of the skin of the face and of the cornea.

OCULAR VACCINE THERAPY. DR. R. GALEAZZI, Rome, Italy.

Dr. Galeazzi demonstrates the possibility of bringing about local immunity of the eye by means of polyvalent vaccines. In his opinion trachoma is due to associated bacteria which have been implanted in a constitutionally trachomatous substratum or terrain, which may be considered as identical with, or at least closely akin to, adenoidism. In order to do away with the various manifestations of trachoma, it is essential to combat the symbiotic bacteria.

A YEAR'S EXPERIENCE WITH VACCINE THERAPY OF TRACHOMA. DR. V. RUATA, Cairo, Egypt.

Dr. Ruata gives a short report on some investigations of the etiology of trachoma and on an ocular vaccine that he has prepared and used with success. This "Ruata eye vaccine" was accepted by the Italian government for the treatment of trachoma on a large scale in a number

of Italian provinces, as well as in Libya, after its value had been confirmed by thorough investigation and successful application under the authority of the national department of public health.

DISCUSSION

DR. M. ESTEBAN: Local vaccination after the method of Besredka is the procedure of choice in the prophylaxis and treatment of trachoma. I use a vaccine prepared from matter expressed from the granulations and inactivated at 60 C.

CLINICAL EVALUATION OF TRACHOMATOUS GRANULATIONS. DR. L. ROSTKOWSKI, Warsaw, Poland.

Most mistakes in the diagnosis of trachoma are due to faulty judgment as to the nature of the conjunctival involvement. Even a granulous (follicular?) conjunctiva is healthy if it presents no inflammatory reaction. The granulation is by no means the local disease of the conjunctiva, which, on the contrary, takes place by way of a constitutional metamorphosis, e. g., in hypoplastic and thymolymphatic subjects. One must make a distinction between catarrh of the smooth, and catarrh of the granulous, conjunctiva. The appearance of the granulations generally allows a person with sufficient experience to differentiate granulous (follicular) catarrh from incipient trachoma.

ANATOMICOPATHOLOGIC AND CLINICAL OBSERVATIONS ON PANNUS TRACHOMATOSUS OF THE CORNEA. DR. A. BUSACCA, San Pablo, Philippine Islands.

Dr. Busacca describes a group of clinical observations which were in the main confirmed by his histologic examination. He suggests a classification for the different forms of pannus, discusses its pathogenesis and describes the principal anatomicopathologic pictures in preparations. He gives details of a technic by means of which he succeeded in producing experimentally in rabbits corneal pannus which was almost like that seen as a complication of trachoma.

TRACHOMA IN MAN AND IN APES. DR. P. OLITSKY, New York.

A characteristic granulomatous conjunctivitis can be produced in apes by rubbing into the normal conjunctiva the secretion from a trachomatous human conjunctiva or by injecting subconjunctivally trachomatous human tissue. This condition can be communicated from ape to ape by injection of tissues through an unlimited number of inoculations or transfers. A similar series of transfers succeeded with cultures of Bact. granulosis obtained from the same human material. The period of inoculation, the transition from the inoculated to the noninoculated eye and the appearance of the initial and of the fully developed local process, as well as that of the histologic changes, are identical in animals whether the disease has been transmitted by means of cultures or by infected tissue. The characteristic follicular change originates around the blood vessels. The clinical picture, when fully developed, resembles that of human trachoma. By means of intra-

corneal injections it is possible to provoke a long continuing keratitis much in the nature of pannus tenuis of human trachoma. It was not possible to demonstrate either by filtration tests or by microscopic examination that trachoma is due to an ultramicroscopic virus. The complicated technic for the isolation of Bact. granulosis must be simplified. The exciters of spontaneous follicular conjunctivitis in Macacus rhesus seem to be specific and microbic rather than ultramicrobic. They can be grown in cultures, and the disease transmitted further. The specific germ is related to the species Bact. granulosis.

HYPERRECEPTIVITY IN TRACHOMA. DR. CATTANEO, Sassari, Sardinia.

Dr. Cattaneo has demonstrated that pathologic changes can be provoked in a previously trachomatous and clinically apparently cured conjunctiva by the local introduction of trachomatous virus, and that these changes are typical of fresh trachoma. Accordingly one must assume that acquired or local immunity to trachoma does not exist. Relapses and superinfections demonstrate the same point. In trachoma there is a special hypersensitivity of the conjunctiva. This condition is the opposite of immunity and is made up of histocellular and humoral factors. The condition may be temporary.

AN ARTISTIC BIT OF CABINET WORK MADE BY A PATIENT CURED OF TOTAL PANNUS OF BOTH CORNEAS. DR. M. MARQUEZ, Madrid, Spain.

The curability of trachoma is undeniable, but social conditions often militate against the success of treatment. This should consist in the application of a solution of corrosive mercuric chloride (1:400), avoiding the cornea or the touching of the tarsal conjunctiva, with a smooth copper stick, and the instillation of atropine, cocaine and epinephrine. Surgical intervention is indicated only in exceptional cases but copper citrate administered intravenously may be of use. Dr. Marquez shows a small piece of furniture decorated with delicate carvings, indicating that the artisan must have had excellent sight. He had been practically blind from trachoma with total pannus. After a year, he left the clinic, cured, with good vision.

PRESENT STATUS OF THE CAMPAIGN AGAINST TRACHOMA IN SPAIN. DR. A. MARIN AMAT and DR. R. TORRES, Madrid, Spain.

Dr. Marin Amat and Dr. Torres give a detailed historical and statistical report, especially on the activities of the Central Commission of the National Antitrachoma Defense Commission. It is to be noted that repeated mention is made of the frequency and malignancy of trachoma in fishermen and the members of their families.

DISCUSSION

DR. RENEDO: I suggest that the assistance of the official bodies concerned be urged. I consider the statistical figures presented by Marin Amat too low.

SPECIAL AGENCIES

International Association for the Prevention of Blindness.

Reports on the activity of the individual national committees were presented containing a great deal of important matter. Dr. Park Lewis spoke for the United States; Dr. Coutela, for France; Dr. van Duyse, for Belgium; Dr. Lijó Pavia, for Argentina; Dr. A. Fuchs, for Austria; Dr. E. H. El Maziny Bey, for Egypt; Dr. van der Hoeve, for Holland; Dr. Alvaro, for Brazil; Dr. Pascheff, for Bulgaria; Dr. Marquez, for Spain; Dr. von Grósz, for Hungary; Dr. Zachert, for Poland; Dr. Moutinho, for Portugal; Dr. Kenel, for Switzerland, and Dr. Wagenmann, for Germany.

Necessity for a Rational Classification of the Causes of Blindness. Dr. M. Marquez, Madrid, Spain.

Dr. Marquez previously (at the meeting of the International Association for the Prevention of Blindness, Paris, Nov. 14, 1931) submitted a sketch plan of this subject, and he suggests that this communication be made the basis of a tentative scheme, in the different groups of which colleagues may introduce alterations. This classification carries in a vertical column notations as to changes in the refracting media, the retina and the optic visual paths and centers, and in horizontal arrangement the name of the ocular or general disease, each eye lost being registered and thus classified at the crossing point of the two groups of each division. For this purpose it is necessary and practically important to take into consideration, not only absolute "stone blindness," but practical blindness, or the degree of loss of vision which would make it impossible or difficult for the subject to move about freely in unfamiliar surroundings or to use the affected eye or eyes. Dr. Marquez calls attention to the fact that even though the same disease may cause blindness in two eyes, blindness may in another case have been caused at different points in time and by two different pathologic processes. For this reason, in any classification from which one intends to draw conclusions or statistics as to the causes of blindness, it is more important to consider the number of lost eyes than that of blind persons. Dr. Marquez's diagrammatic schema is to be found in the original paper.

DISCUSSION

Drs. Coutela, Maziny Bey, Alvaro, Pascheff, Leoz, Ballantyne, Marx and van Duyse discussed the report. A committee was elected and charged with unifying the term and conception of blindness, particularly occupational blindness. This committee was composed of Drs. de Lapersonne, Park Lewis, Bishop Harmon, Maziny Bey, Marx and Marquez.

Unification of Regulations as to Visual Requirements for Aviators, Automobile Drivers, Railway Personnel and Seamen.

A resolution was passed to publish in all periodicals the following suggestions of Drs. Verrey, Coppez and Magitot:

General Rules.—1. Visual tests are to be made by oculists, or at least by physicians with special training. In the latter case, the exam-

ined person, if there is any doubt, shall be referred to an ophthalmologist for check-up and examination.

2. All persons qualified to make examinations must be familiar with their own visual acuity.

3. Tests of color vision shall be carried out only by persons with normal color sense.

4. The pupillary reaction is to be recorded at each examination.

5. Visual tests are to be made with wall charts constructed according to Snellen placed at least 5 meters from the patient, with an illumination of 30 lux.

6. The visual fields are to be taken always. The digital confrontation method is sufficient as a routine. The perimeter, or other apparatus, is to be used in case of unsatisfactory or hesitating response. (Exception: In the case of aviators and drivers of public motor cars, the certificate of examination is to be accompanied by a visual field chart.

7. Color sense is to be tested by several methods, among them isochromatic tables (if possible those of Stilling or of Ishihara). Nagel's anomaloscope or some spectroscopic apparatus is to be used for the examinations by experts or for the tests of color perception in persons requiring an especially keen color sense, such as locomotive engineers.

8. Light sense is to be considered in every case. The resolutions adopted by the congress in regard to the subject of light sense shall be applicable to the examination of aviators, automobile drivers, railway personnel and seamen.

9. Space sense is to be examined in aviators and drivers of public automobiles, by rapid testing of the coordination and balance of the external ocular muscles and of the projection of images, then by testing of the ability to fuse simple images, and finally by testing of stereoscopic vision.

Special Rules.—Aviators in public service must have vision of 1; 1, 0.7 being accepted after a number of years.

Private pilots must have vision of 0.7; 0.5 without glasses and 0.7 with correction. Only very low degrees of ametropia are admissible. The fields and the color sense must be normal. Light sense and vision in the dark must be perfect. Complete examination of binocular vision must be made. Periodic examinations are made as a check-up, twice a year for public, and once for private, service.

Automobile drivers in public service must have vision of 1; 0.7; and those wearing correcting glasses may not be accepted unless they have reached the age of 40, and not more than 4 diopters of ametropia is admissible. The visual fields, binocular vision, light sense and color perception must be normal. Periodic examinations must be made every three years.

Drivers of taxicabs must have the same degree of visual acuity as drivers in public service, but correcting glasses are acceptable, ab initio, with a maximum permissible of 6 diopters of ametropia. The remaining regulations are the same as for public service. Reexamination must be made every five years.

Private chauffeurs must secure a driving license, practical tests on the road by daylight and at night being obligatory. A previous declaration is required: The candidate is personally responsible for declaring himself physically fitted to drive a motor car. An examination may be demanded by the board if practical tests arouse a doubt as to physical fitness. Examination shall be compulsory after any accident in which the responsibility of the driver is involved. The visual requirements are as follows: binocular vision, corrected, 0.6 (0.1 in the weaker eye); no diplopia; visual field not contracted to more than 140 degrees; light sense not decidedly lowered. The color sense is to be examined only in case vision is less than 0.5. Subjects with only one eye may be accepted (after one year in which to become accustomed to the condition); the vision of the remaining eye must be 0.8, and the visual field, color sense and light sense, perfect.

Railway personnel is divided into three groups, engaged in: (*a*) transportation; (*b*) signaling, inspection and guarding, and (*c*) office service. Vision must be: (*a*) without glasses, 1; 0.7; with correction, 0.7; 0.5 (reexaminations are made at regular intervals of three years and for engine drivers each year); (*b*) without glasses, 0.5; 0.5; with correction, 0.7; 0.7; (*c*) with and without glasses, 0.5; 0.3. For groups (*a*) and (*b*) the visual field must be practically complete and the color sense, perfect. The light sense must be normal in drivers of engines, for whom tests are obligatory; other employees are to be examined in case of doubt. Good binocular vision is essential.

Seamen on admission must have vision of 0.7; 0.5. Glasses are not allowed. Normal visual fields and color sense are required. A test of the light sense is desired. No diplopia is admissible. Periodic reexamination is made every three years. In the first ten years, vision of 0.7; 0.3 is required; after ten years of service, 0.5; 0.3. All persons responsible for the navigation of a vessel and all seamen doing watch duty must have passed the tests prescribed by the commission.

DISCUSSION

Drs. Onfray, Terrien, Baillart (for Polack), Onfray, Coppez, Lauber, Verrey and Magitot discussed the report.

EXECUTIVE SESSION

All ophthalmologic societies are to contribute one-fourth Swiss franc per member to defray the expenses of the international ophthalmologic council. A new edition of the "Indicia medicorum" is to be published.

The following resolutions are to be communicated to the governments of all countries: Whereas errors of refraction constitute a real disease and may give rise to serious mistakes in diagnosis and as the determination of the refraction in children is a task of the greatest importance and an insufficient or inaccurate correction may lead to serious consequences later; and whereas errors of refraction in adults, particularly in the aged, may be the first indication or the result of serious local or constitutional disease, such as diabetes, glaucoma or cataract: Be it resolved (1) that testing of refraction is a predominantly medical activity; (2) that such examination, and consequently also the prescrip-

tion of correcting glasses, shall be effected by physicians only, and (3) that there are, accordingly, urgent grounds to call the attention of the public authorities to the campaign now being waged in certain countries to separate the determination of refraction from the body of ophthalmology and so to make it the legal prerogative of a nonmedical artisan who calls himself an optometrist, optometric optician or refractionist.

DISCUSSION

Drs. Nordenson and Coutela contributed to the discussion.

The next International Congress is to take place in 1937, at Cairo, Egypt.

Dr. El Maziny Bey, in the name of Egypt, thanked the congress for this decision.

ROYAL SOCIETY OF MEDICINE, SECTION OF OPHTHALMOLOGY

Oct. 13, 1933

A. C. HUDSON, F.R.C.S., *President, in the Chair*

LUPUS ERYTHEMATOSUS, WITH LESIONS OF THE FUNDUS. DR. H. SEMON, Dermatologist, and MR. EUGENE WOLFF, Ophthalmologist.

DR. H. SEMON: A young woman, aged 26, who had rheumatic pains in the shoulders and limbs, was treated with salicylates, which relieved the pains and checked the mild pyrexia. A fortnight before consultation she sat in the garden to get fresh air and sunlight; there was a four hour exposure of the face, neck and chest. The next day and on the succeeding days there were pronounced redness and a feeling of burning over the exposed areas. Her admission to the hospital because of suspected lupus erythematosus was justified, for she had marked symptoms of that disease a fortnight later; she had fresh patches almost daily, with a purpuric tendency and even necrosis. She also showed mental irritability alternating with somnolence; pronounced gingivitis, with bleeding of the gums; a rapid pulse rate, and a septic temperature. Leukopenia was followed by albuminuria. The misty vision was noticed, but it was ascertained that this had been present before she entered the hospital.

MR. EUGENE WOLFF: I first saw the patient five weeks after the onset of the disease of the skin. On the nasal side of the right fundus there was a round, slightly raised, whitish area, about a fourth of a disk area in extent. A retinal vein passed over the lesion, which was raised above the general level of the retina. The lesion was not yellow like a miliary tubercle; it was seen at intervals until death. No vitreous opacities could be seen. General autopsy was not permitted, but on the morning following death the posterior portion of the right eye was removed. No tubercle and no organism could be found. There was a slight, fairly generalized invasion of the choroid by inflammatory cells. At the site of the original lesion there was a well marked subretinal exudate containing inflammatory cells, pigment, spindle cells and capillary vessels.

NORMAL MEDULLATION OF THE OPTIC PAPILLA IN THE DOG. MR. EUGENE WOLFF (in association with DR. FRANCIS DAVIES).

The normal anatomy of the optic papilla of the dog differs in many ways from that of man. In the absence of recognition of this fact, experiments on the dog are apt to be misapplied to man.

If the eyeball of the living dog is removed and divided equatorially, the vitreous taken out and the head of the optic nerve examined with the slit lamp, the edge of the disk is seen to be very irregular, with short whitish processes extending centrifugally from the whole circumference. If the disk is examined in the intact animal with the ophthalmoscope, its edge, normally, is not sharply defined. The eyes of six normal dogs were examined; all showed that the nerve head is medullated in the dog. Unlike the optic nerve fibers in man, those in the dog do not lose their medullary sheath in the region of the lamina cribrosa. The medullation extends to the edge of the disk and involves the whole of it.

HYPOTONY AFTER SCLEROCORNEAL TREPHINATION. MR. A. C. HUDSON.

When the patient was first seen by the exhibitor, in July, 1933, both eyes had been operated on five months previously for chronic glaucoma by sclerocorneal trephination. In the left eye the result of the operation was satisfactory; the tension was normal, and vision was 6/6 with correction. In the right eye the fistula had a very thin covering of stretched conjunctiva; the intra-ocular pressure was very low; the optic disk was prominent, and on the retina were many fine dark lines, suggesting wrinkles. There was no detachment of either the retina or the choroid. With glasses, vision in this eye was only 6/24. The fluorescein test indicated the presence of a tiny fistula in the portion of the conjunctiva covering the sclerocorneal fistula. Attempts have been made to close this by plastic operation, but they have not been successful.

DISCUSSION

MR. T. HARRISON BUTLER: There may be danger of late infection in this case; hence the fistula should be healed. I suggest the actual cautery.

MR. F. A. JULER: This case reminds me of one which I saw, in which there was glaucoma of one eye. The conjunctiva was very thin over the fistula, and the latter continued to drain for three or four weeks. I scraped away the adjacent corneal epithelium and brought down a large conjunctival flap. The anterior chamber then reformed. The tension is now about normal.

STAPHYLOCOCCIC ABSCESS OF THE SCLEROTIC. MR. A. C. HUDSON.

A nurse, aged 29, had a carbuncle on the right cheek in May, 1933. There was no glycosuria. About the same time the right eye became inflamed, and an abscess developed in the sclerotic, at the upper limbus. There was intense iritis. The fundus reflex was practically absent, and vision was reduced to mere perception of light. Ten days later the abscess of the sclerotic was incised, and Staphylococcus aureus was cultivated from the pus. Some vitreous opacity remains, but there is no sign of active inflammation.

CYSTS IN A DETACHED RETINA. MR. A. C. HUDSON.

Defective sight in a farm laborer, aged 29, dates from a blow on the right eye from a cow's tail. The Wassermann reaction was negative. Vision in the right eye is 6/8. The lower part of the retina is detached, and in the most anterior part of the detachment are two well defined cysts. I think that I can see a hole in the retina. Should the eye be operated on?

DISCUSSION

MR. LESLIE PATON: I have had under observation for five years a case in which the detachment is sharply limited by a choroidal scar running horizontally. There is no vision in the other eye because of detachment. Within the five years the shape has remained unchanged, as though it were impossible for the detachment to get beyond the scar.

PEMPHIGUS CONJUNCTIVAE. MR. B. W. RYCROFT.

The left eye of a butcher, aged 55, became irritated two years ago. The other eye is beginning to show a similar condition. The eyes have sustained neither accident nor injury. There is no history of ocular trouble in the family. Several measures have been tried, including extract of harderian glands, but only treatment with radium seems to have been effective.

DISCUSSION

MR. A. C. HUDSON: The patient may become blind. The late Herbert Fisher presented a somewhat similar case. The patient contracted measles, after which the pemphigus cleared up. It was thought that this cure was a sequel of the measles. In a case of my own I treated the patient with convalescent measles serum, but it had no effect on the pemphigus. Despite that, however, the serum seems worth trying in the present case. No harm can result.

MR. TUDOR THOMAS: The gray patch at the corneoscleral junction is similar to that in a case which I described three or four years ago under the title, "Epithelial Hyperplasia of the Cornea in a Tar Worker." When the patient receives applications of radium the patch clears up, but later it recurs.

DR. H. SEMON: The pathologic changes in the hyperplasia, which are probably epitheliomatous, would differ from those of pemphigus and might be expected to be influenced by radium, whereas there seems to be no reason to expect that pemphigus would be influenced by radium, as any apparent benefit is due to absorption of fibrous tissue and healing of the surfaces.

MELANOTIC SARCOMA OF THE CILIARY BODY. MR. B. W. RYCROFT.

A woman, aged 55, noticed a speck on the white of the left eye eighteen months ago. A second speck was noted a week ago. There has been no recent illness, and the patient's weight has been well maintained. The family physician says that the liver is not enlarged, and there does not appear to be anything abnormal in the chest. Melanin has been found in the urine, and there are a number of pigmented moles over

the body. In the angle of the anterior chamber there is a small heavily pigmented growth. The iris is pushed inward, and the pupil is distorted. A pigmented protuberance can be seen behind the iris.

RUPTURED GLOBE WITH CATARACT. MR. O. GAYER MORGAN.

A woman, aged 59, received a blow on the eye four years ago. There is a large staphyloma just above the cornea; the pupil is pulled to the upper part of the eye, and there is a cataract. Projection of light is good. The question is raised as to the best method of extracting the cataract.

DISCUSSION

MR. A. C. HUDSON: It is difficult to know what to do, for if section was made near the staphyloma there would be disaster. If there is solid vitreous, one has to be careful about couching. If needling is intended, it is best first to make a corneal section above, making the pupil V-shaped, with the apex downward.

MR. FOSTER MOORE: I should dissect the conjunctiva carefully from the prominence and delicately expose the iris, putting a stitch in the lower and upper lips of the wound ready to tie. Then I should cut off the prolapsed iris boldly and tie the stitch. That would probably bring the conjunctiva over.

TUBULAR SPECTACLES. MR. LESLIE PATON.

In some cases of very defective reading vision in old people I have found that distinct improvement can be obtained by concentrating the vision by the use of tubes set in a frame to shut off all extraneous light. An instance of benefit is the following: A man, aged 65, showed extensive chorioretinal degeneration, with vision reduced to within 10 degrees of the fixation point; central vision was 6/24 in the right eye and less than 6/60 in the left. His reading vision has improved so much that he is now able to read his own letters, and he has ordered nine pairs of the tubes. Other instances in which tubular spectacles are of benefit are mainly in cases of cataract in which improvement has been from Jaeger's test type number 8 to number 2 and from number 12 to number 1.

NEW YORK ACADEMY OF MEDICINE, SECTION OF OPHTHALMOLOGY

W. GUERNSEY FREY, JR., M.D., *Secretary*

Oct. 16, 1933

WEBB W. WEEKS, M.D., *Chairman*

RETINAL DETACHMENT TREATED BY ENDOTHERMY. DR. ARNOLD KNAPP.

The patient, 37 years of age, lost sight in his right eye twelve years ago from detachment of the retina. He came to the hospital in April, 1933; he stated that he had failing of sight in the left eye of two weeks'

standing. The left eye showed a myopia of 16 diopters, and a vision of fingers at 4 feet (1.2 meters). There was a large detachment of the retina in the upper temporal quadrant, with a horseshoe-shaped tear in the 1:30 o'clock meridian. The tear measured 4 disk diameters in length, and its distal margin was 6 disk diameters from the ophthalmoscopic periphery. At operation the sclera was exposed in the upper and outer quadrant, and a seven-pronged electrode was applied at 24 mm. back of the limbus in the 1:30 meridian. On ophthalmoscopic examination this proved to be just too far back, and another application was made at 22 mm., followed by a number of single punctures above and below. The healing was uneventful. Today the retina is in place, the field is intact, and there is a circumscribed choroidal change corresponding to the coagulated region. There are fine vitreous opacities, with some old myopic macular changes, and a corrected visual acuity of 6/36.

DISCUSSION

DR. MARK J. SCHOENBERG: I should like to ask what types of cases of detachment Dr. Knapp considers fit for operation, and what types he rejects.

DR. KNAPP: To answer Dr. Schoenberg's question adequately would require a great deal more time than we have at our disposal this evening. While the usual delimiting method is easy and satisfactory in peripheral lesions, the central lesions, such as the aforementioned one, require a direct application of the electrodes to the affected area.

STUDIES OF THE VISUAL FIELD AS AN AID IN LOCALIZING AND IDENTIFYING LESIONS OF THE CENTRAL NERVOUS SYSTEM. DR. THOMAS H. JOHNSON.

Using lantern slides, Dr. Johnson gave a demonstration of defects of the visual fields that had been helpful in localizing lesions of the central nervous system. Studies of the visual fields have been recorded in 3,346 cases of neurologic disease at the Neurological Institute. The following characteristic changes in the field have been found: altitudinal hemianopia, 7 cases; bitemporal hemianopia, 42 cases; homonymous hemianopia, 143 cases, binasal hemianopia, 1 case, making a total of 193 cases of hemianopia.

In only 2 of the cases of altitudinal hemianopia had the intracranial pathologic condition been determined by operation. In one of the cases a posterior frontal parasagittal meningioma was found; in the other, a large frontoparietal osteosarcoma.

Homonymous hemianopia or quadrantopia usually indicates a lesion central to the geniculate bodies. Lesions limited to the optic tract are not common. A neoplasm that involves the optic tract, because of the anatomic relations at the base of the brain, will produce so many other signs that it is not difficult to locate the tumor in the middle fossa.

A tumor that invades or compresses the optic radiations or visual centers produces hemianopic changes in the visual fields, and no ocular signs have been demonstrated to indicate whether the lesion is in the temporal or in the occipital lobe. A tumor of the temporal lobe is

much more common than a growth in the occipital lobe. A tumor in the anterior part of the temporal lobe usually produces a quadrantic defect, and a lesion in the posterior part of the temporal lobe or in the occipital lobe usually produces a hemianopic defect.

CLINICAL MANIFESTATIONS AND ANATOMIC CHANGES OCCURRING IN CASES OF NEUROLOGIC DISEASE ASSOCIATED WITH CHANGES IN THE VISUAL FIELDS. DR. JULIUS R. GLOBUS.

This paper will be published in full in a latter issue of the ARCHIVES.

DISCUSSION OF THE PAPERS OF DR. JOHNSON AND DR. GLOBUS

DR. FOSTER KENNEDY: One can to some extent classify the signs and symptoms of tumors of the brain into those of direct localizing value, and those of false localizing value. For instance, if one is to say that a tumor necessarily involves the sixth nerve because it causes paralysis of the sixth nerve, nine times out of ten one will be wrong. The paralysis is usually due to indirect pressure. That does not apply to involvement of the visual apparatus, which gives defects of the field of direct localizing value.

Occasional rapid blindness is caused by direct pressure on the chiasm by the expanding floor of the third ventricle.

When I first studied tumors of the temporal lobe, I made a mistake in saying that defects of the visual fields did not occur. I have learned since that they do occur, that they are extraordinarily important, and that they are quadrantic. Furthermore, if a tumor or an abscess is placed low, the upper quadrantic field is affected, and vice versa.

DR. JOHN N. EVANS: The difficulties of making reliable studies of the fields on patients too sick to cooperate can hardly be appreciated unless one has attempted to supply to the neurosurgeon necessary evidence as to the fields. A dimly glowing ophthalmoscope, a ball of cotton, or a strip of paper may be the only objects that give useful information in a particular instance.

There are two origins for defects of the field: One is in damage to the fiber bundle; the other, in a rise of intracranial pressure. The wedge-shaped defect arising from damage to the fiber bundle has the apex pointing toward the point of fixation, whereas the wedge-shaped defect arising from disturbed flow of blood or lymph has its apex pointing toward the blind spot.

There is probably no such condition as a concentric contraction of the visual field—at least in the geometric sense depicted in so many of the charts. Maps that show this much talked of defect are the result of using a faulty technic. Central scotomas, on the other hand, have been shown to arise by one or the other or both of the mechanisms just referred to, i. e., damage to the fiber bundle or increased intracranial pressure.

DR. THOMAS H. JOHNSON: It is interesting to speculate on how a patient with tumor of the frontal lobe can have a central scotoma before any other defect of the field becomes manifest. I think that de Schweinitz has given the explanation. In his Bowman lecture, he expressed the opinion that the bitemporal scotomas often seen early

in pituitary tumor are due to toxins thrown out by the tumor which act on the papillomacular bundle. I should be interested to hear what Dr. Kennedy thinks of that explanation.

DR. FOSTER KENNEDY: You ask me whether toxins liberated by a tumor can affect the papillomacular bundle? You are familiar with the fact that in nerve tissue the more impulses that pass through an arc, the more susceptible it is to any kind of insult, trauma or toxin, and it may be that the macular bundle is by its very delicacy of physiologic function anatomically more vulnerable.

Book Reviews

Trachoma. By Prof. W. W. Tschirkowsky. Pp. 232, with 33 illustrations. Leningrad: Leningrad Medical Publishers, 1932.

This monograph on trachoma, by one of the best known Russian authorities on the subject, is written in a concise manner; at the same time the subject is dealt with exhaustively. The author is a follower of the dualistic school, which considers trachoma to be an independent pathologic unit. The book is divided into several chapters, dealing with the clinical picture of trachoma, the diagnosis and differential diagnosis, the pathology of the disease, etc. The etiology is considered under the following headings: bacteriologic, constitutional, social and hygienic. The most recent experimental work is reviewed.

Since trachoma is still an important disease in Soviet Russia and is a cause of blindness in some sections in as many as 2 per cent of all the patients affected, Professor Tschirkowsky has devoted one chapter to prophylaxis, in which the regulations and measures applied by the State Health Department in schools, factories and agricultural regions to control this social disease are described. Many statistical data as to the incidence of trachoma, the blindness caused by it and the geographic distribution of the disease in Russia and the world are given. According to the census of 1926, there were 961,408 cases in Soviet Russia, an incidence of 65.9 per ten thousand of the population.

The treatment is covered by the author completely to date. Local medical therapy includes recent attempts to treat the disease with several Italian proprietary remedies, chaulmoogra oil and various subconjunctival injections. The surgical and physical therapy, radiotherapy, electrotherapy and specific and nonspecific general therapy used in treatment are also described.

Each point is clearly discussed. The author has a profound knowledge of the subject. An enormous bibliography of the Russian and foreign literature is appended.

OLGA SITCHEVSKA.

Senile Cataract: Methods of Operating. By W. A. Fisher. Second edition. Price, $1. Pp. 267, with 183 illustrations. Chicago: Chicago Eye, Ear, Nose and Throat College, 1933.

In this new edition of his book on operation for cataract the author has rewritten the sixth chapter and added a new chapter on a suction technic. Dr. A. Van Lint of Brussels, Belgium, contributes a chapter on his methods of performing extracapsular and intracapsular extractions, and the fitting of correcting glasses is described by Dr. O. B. Nugent of Chicago.

ARNOLD KNAPP.

Directory of Ophthalmologic Societies *

INTERNATIONAL

International Association for Prevention of Blindness

President: Prof. F. de Lapersonne, 217, Faubourg St. Honoré, Paris.
Secretary-General pro tem: Dr. A. Churchill, 66 Boulevard St. Michel, Paris.

International Ophthalmologic Congress

Secretary: Dr. Francisco Poyales, Olozaga 3, Madrid.

FOREIGN

British Medical Association, Section on Ophthalmology

President: Dr. Frank H. Crawley, 5 Fitzwilliam Pl., Dublin.

Ophthalmological Society of Bombay

President: Dr. D. D. Sathaye, 127 Girgaum Road, Bombay 4.
Secretary: Dr. H. D. Dastur, Dadar, Bombay, 14.
Place: H. B. A. Free Ophthalmic Hospital, Parel, Bombay 12. Time: First Friday of every month.

Ophthalmological Society of the United Kingdom

President: Mr. A. H. H. Sinclair, 6 Charlotte Square, Edinburgh.
Secretary: Mr. Humphrey Neame, 56 Portland Place, London, W. I.
Time: April 12-14, 1934.

Oxford Ophthalmological Congress

Master: Dr. Cyril Walker, Bristol, England.
Secretary: Dr. C. G. Russ Wood, Hill House, Abberbury Rd., Iffley, Oxford, England.
Time: July 4-7, 1934.

Royal Society of Medicine, Section of Ophthalmology

President: Dr. A. C. Hudson, 50, Queen Anne St., W. 1, London.
Secretary: Dr. J. D. Magor Cardell, 27, Weymouth St., W. 1, London.
Place: London. Time: June 8, 1934.

Société Française d'Ophthalmologie

Secretary: Dr. René Onfray, 6 avenue de la Motte Picquet, Paris 7è.
Place: Majestic Hotel, Paris. Time: May 14, 1934.

German Ophthalmological Society

Secretary: Prof. A. Wagenmann, Heidelberg.
Time: 1934.

NATIONAL

American Medical Association, Section on Ophthalmology

Chairman: Dr. William C. Finnoff, 1612 Tremont St., Denver.
Secretary: Dr. Parker Heath, 1551 Woodward Ave., Detroit.
Place: Cleveland. Time: June 11-15, 1934.

American Academy of Ophthalmology and Otolaryngology

President: Dr. J. M. Wheeler, 635 W. 165th St., New York.
President-Elect: Dr. Wells P. Eagleton, 15 Lombardy St., Newark, N. J.
Executive Secretary-Treasurer: Dr. William P. Wherry, 1500 Medical Arts Bldg., Omaha.
Place: Chicago. Time: Sept. 9-14, 1934.

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* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

AMERICAN OPHTHALMOLOGICAL SOCIETY

President: Dr. W. G. M. Byers, 1458 Mountain St., Montreal.
Secretary-Treasurer: Dr. J. Milton Griscom, 2213 Walnut St., Philadelphia.
Place: Lucerne, Que. Time: July 9-11, 1934.

NATIONAL SOCIETY FOR THE PREVENTION OF BLINDNESS

President: Mr. William Fellowes Morgan.
Managing Director: Mr. Lewis H. Carris, 450, 7th Ave., New York.
Place: New York. Time: November, 1934.

SECTIONAL

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

President: Dr. Hugo B. C. Riemer, 128 Newbury St., Boston.
Secretary-Treasurer: Dr. Benjamin Sachs, 483 Beacon St., Boston.
Place: Massachusetts Eye and Ear Infirmary, 243 Charles St., Boston. Time: 8 p. m., third Tuesday of each month from November to April, inclusive.

PACIFIC COAST OTO-OPHTHALMOLOGICAL SOCIETY

President: Dr. A. W. Morse, 66 W. Park St., Butte, Mont.
Secretary-Treasurer: Dr. Frederick C. Cordes, 384 Post St., San Francisco.
Place: Butte, Mont. Time: July 16-18, 1934.

PUGET SOUND ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. Francis A. Brugman, 509 Olive St., Seattle.
Secretary-Treasurer: Dr. Noble Dick, 1115 Terry Ave., Seattle.
Time: 8 p. m., third Tuesday of each month, except July and August.

ROCK RIVER VALLEY EYE, EAR, NOSE AND THROAT SOCIETY

President: Dr. Harry Shearer, 405 E. Grand Ave., Beloit, Wis.
Secretary-Treasurer: Dr. W. S. Beyer, 1101 Talcott Bldg., Rockford, Ill.
Place: Rockford, Ill., Janesville or Beloit, Wis. Time: Third Tuesday of each month.

SAGINAW VALLEY ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President, Dr. A. R. McKinney, 703 Second National Bank Bldg., Saginaw, Mich.
Secretary-Treasurer: Dr. W. K. Slack, 308 Eddy Bldg., Saginaw, Mich.
Place: Saginaw, Mich., or Bay City, Mich. Time: First Friday of each month, except July and August.

SIOUX VALLEY EYE AND EAR ACADEMY

President: Dr. John B. Gregg, 101 S. Main St., Sioux Falls, S. Dakota.
Secretary-Treasurer: Dr. F. H. Roost, 420 Trimble Bldg., Sioux City, Iowa.

SOUTHERN MEDICAL ASSOCIATION, SECTION ON EYE, EAR, NOSE AND THROAT

Chairman: Dr. Dunbar Roy, 113 N. Pryor St., Atlanta, Ga.
Secretary: Dr. William A. Wagner, 914 American Bank Bldg., New Orleans.
Place: New Orleans. Time: 1934.

SOUTHWESTERN MICHIGAN TRIOLOGICAL SOCIETY

President: Dr. Carl Snapp, 604 Medical Arts Bldg., Grand Rapids.
Secretary-Treasurer: Dr. Lee O. Grant, 420 Medical Arts Bldg., Grand Rapids.
Time: Third Thursday of alternate months.

WESTERN PENNSYLVANIA EYE, EAR, NOSE AND THROAT SOCIETY

President: Dr. O. G. A. Barker, 532 Main St., Johnstown.
Secretary-Treasurer: Dr. C. W. Beals, Weber Bldg., DuBois.
Time: Third Thursday of October and May.

STATE

Colorado Ophthalmological Society

President: A presiding officer is selected for each meeting alternately until all members have served.
Secretary: Dr. Edna M. Reynolds, 920 Republic Bldg., Denver.
Place: Capitol Life Building, Denver. Time: 7:30 p. m., third Saturday of the month, October to April, inclusive.

Connecticut State Medical Society, Section on Eye, Ear, Nose and Throat

President: Dr. Edward J. Whalen, 750 Main St., Hartford.
Secretary-Treasurer: Dr. Walter L. Hogan, 750 Main St., Hartford.
Time: May, November.

Eye, Ear, Nose and Throat Club of Georgia

President: Dr. W. R. Bedingfield, 753 Broad St., Augusta.
Secretary-Treasurer: Dr. J. A. Smith, 700 Spring St., Macon.
Place: Augusta. Time: May, 1934.

Indiana Academy of Ophthalmology and Oto-Laryngology

President: Dr. J. Kent Leasure, 23 E. Ohio St., Indianapolis.
Secretary: Dr. Fred Overman, 611 Hume-Mansure Bldg., Indianapolis.
Place: Richmond. Time: Dec. 12, 1934.

Iowa Academy of Ophthalmology and Oto-Laryngology

President: Dr. W. F. Boiler, 105 E. Iowa Ave., Iowa City.
Secretary-Treasurer: Dr. Lawrence A. Taylor, 118 E. Second St., Ottumwa.

Michigan State Medical Society, Section of Ophthalmology and Otolaryngology

Chairman: Dr. Peter T. Grant, 148 Monroe Ave., Grand Rapids.
Secretary: Dr. Ralph B. Fast, 1410 Bank of Kalamazoo Bldg., Kalamazoo.
Place: Battle Creek. Time: 1934.

Minnesota Academy of Ophthalmology and Oto-Laryngology

President: Gordon B. New, Mayo Clinic, Rochester.
Secretary-Treasurer: Dr. Walter E. Camp, Medical Arts Bldg., Minneapolis.
Time: Second Friday of each month from October to May.

Montana Academy of Oto-Ophthalmology

President: Dr. Lawrence G. Dunlap, 101 Main St., Anaconda.
Secretary: Dr. A. W. Morse, Phoenix Bldg., Butte.

New Jersey State Medical Society, Section on Ophthalmology, Otology and Rhinolaryngology

Chairman: Dr. S. T. Hubbard, 294 State St., Hackensack.
Secretary: Dr. G. S. Laird, 125 Central Ave., Westfield.
Place: Atlantic City. Time: June, 1934.

New York State Medical Society, Eye, Ear, Nose and Throat Section

Chairman: Dr. Frank M. Sulzman, 1831 Fifth Ave., Troy.
Secretary: Dr. Webb W. Weeks, 20 E. 53rd St., New York.
Place: Utica. Time: May 14-16, 1934.

North Dakota Academy of Ophthalmology and Oto-Laryngology

President: Dr. H. O. Ruud, 318 De Mers Ave., Grand Forks.
Secretary-Treasurer: Dr. F. L. Wicks, 516 Fourth St., Valley City.
Place: Valley City. Time: 1934.

OREGON ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY
President: Dr. A. B. Dykman, Medical Dental Bldg., Portland.
Secretary-Treasurer: Dr. Andrew J. Browning, 418 Mayer Bldg., Portland.
Place: Good Samaritan Hospital. Time: Third Tuesday of each month.

RHODE ISLAND OPHTHALMOLOGICAL AND OTOLOGICAL SOCIETY
President: Dr. Robert C. O'Neil, 105 Waterman St., Providence.
Secretary and Treasurer: Dr. Gordon J. McCurdy, 122 Waterman St., Providence.
Place: Rhode Island Medical Library. Time: 8:30 p. m., second Thursday in October, December, February and April.

SOUTH CAROLINA SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY
President: Dr. Walter Bristow, Medical Bldg., Columbia.
Secretary: Dr. J. W. Jervey, Jr., 101 Church St., Greenville.

TENNESSEE ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY
President: Dr. C. D. Blassingame, 899 Madison Ave., Memphis.
Secretary-Treasurer: Dr. Ralph O. Rychener, 130 Madison Ave., Memphis.

TEXAS OPHTHALMOLOGICAL AND OTO-LARYNGOLOGICAL SOCIETY
President: Dr. C. C. Cody, 1304 Walker Ave., Houston.
Secretary: Dr. O. M. Marchman, 1719 Pacific Ave., Dallas.

UTAH OPHTHALMOLOGICAL SOCIETY
President: Dr. F. R. Slopanskey, 9 Exchange Pl., Salt Lake City.
Secretary-Treasurer: Dr. T. F. Welsh, 920 Boston Bldg., Salt Lake City.
Time: Third Monday of each month.

VIRGINIA SOCIETY OF OTO-LARYNGOLOGY AND OPHTHALMOLOGY
President: Dr. H. G. Preston, 307 Professional Bldg., Harrisonburg.
Secretary: Dr. Edwin W. Burton, 104 E. Market St., Charlottesville.

WEST VIRGINIA STATE MEDICAL ASSOCIATION, EYE, EAR, NOSE AND THROAT SECTION
President: Dr. Harry V. Thomas, 95 Fairmont Ave., Fairmont.
Secretary: Dr. W. F. Beckner, 1050 Fifth Ave., Huntington.

LOCAL

ACADEMY OF MEDICINE OF NORTHERN NEW JERSEY, SECTION ON EYE, EAR, NOSE AND THROAT
Chairman: Dr. Browne Morgan, 260 Liberty St., Bloomfield.
Secretary: Dr. A. Russell Sherman, 671 Broad St., Newark.
Place: 91 Lincoln Park South. Time: 8:45 p. m., second Monday of each month.

ACADEMY OF MEDICINE OF TORONTO, SECTION OF OPHTHALMOLOGY
Chairman: Dr. Colin Campbell, 170 St. George St., Toronto.
Secretary: Dr. H. M. Macrae, 170 St. George St., Toronto.
Time: First Monday of winter months.

ATLANTA EYE, EAR, NOSE AND THROAT SOCIETY
President: Dr. W. L. McDougall, 50 Whitehall St., Atlanta, Ga.
Secretary: Dr. William O. Martin, Jr., 384 Peachtree St., Atlanta, Ga.
Place: Academy of Medicine, 38 Prescott St., N. E. Time: 8 p. m., last Thursday of each month.

BALTIMORE MEDICAL SOCIETY, SECTION ON OPHTHALMOLOGY
Chairman: Dr. Benjamin Rones, Johns Hopkins Hospital, Baltimore.
Secretary: Dr. William M. Rowland, 906 Cathedral St., Baltimore.
Place: Medical and Chirurgical Faculty, 1211 Cathedral St. Time: 8:30 p. m., fourth Thursday of each month from October to May.

Brooklyn Ophthalmological Society

President: Dr. W. F. C. Steinbugler, 515 Ocean Ave., Brooklyn.
Secretary: Dr. Walter V. Moore, 1 Nevins St., Brooklyn.
Place: Kings County Medical Society Bldg., 1313 Bedford Ave. Time: Third Thursday in February, April, May, October and December.

Buffalo Ophthalmologic Club

President: Dr. H. H. Glosser, 448 Franklin St., Buffalo.
Secretary-Treasurer: Dr. I. J. Koenig, 40 North St., Buffalo.

Chicago Ophthalmological Society

President: Dr. Dwight C. Orcutt, 30 N. Michigan Ave., Chicago.
Secretary: Dr. Richard C. Gamble, 30 N. Michigan Ave., Chicago.
Place: Medinah Michigan Avenue Club, 505 N. Michigan Ave. Time: Third Monday of each month from October to May.

Cleveland Academy of Medicine, Section of Ophthalmology and Oto-Laryngology

Chairman: Dr. A. L. Stotter, 1148 Euclid Ave., Cleveland.
Secretary: Dr. James T. Collins, 1105 Medical Arts Bldg., Cleveland.
Place: Winton Hotel. Time: Fourth Friday of each month.

Cleveland Ophthalmological Club

Chairman: Dr. W. P. Chamberlain, 7405 Detroit Ave., Cleveland.
Secretary: Dr. A. D. Ruedemann, Cleveland Clinic, Cleveland.

College of Physicians, Philadelphia, Section on Ophthalmology

Chairman: Dr. John Milton Griscom, 2213 Walnut St., Philadelphia.
Clerk: Dr. Alexander G. Fewell, 1924 Pine St., Philadelphia.
Time: Third Thursday of every month from October to April, inclusive.

Columbus Ophthalmological and Oto-Laryngological Society

Chairman: Dr. Albert D. Frost, 681 E. Broad St., Columbus, Ohio.
Secretary-Treasurer: Dr. M. Goldberg, 328 E. State St., Columbus, Ohio.
Time: First Monday of each month.

Dallas Academy of Ophthalmology and Oto-Laryngology

President: Dr. T. S. Love, 1719 Pacific Ave., Dallas, Texas.
Secretary: Dr. Daniel Brannin, 1719 Pacific Ave., Dallas, Texas.
Place: Dallas Athletic Club. Time: 6:30 p. m., first Tuesday of each month from October to June. The November, January and March meetings are devoted to clinical work.

Des Moines Academy of Ophthalmology and Otolaryngology

President: Dr. C. C. Walker, 410 6th Ave., Des Moines, Iowa.
Secretary-Treasurer: Dr. Grace Doane, 614 Bankers Trust Bldg., Des Moines, Iowa.
Time: 7:45 p. m., third Monday of every month, September to May.

Detroit Ophthalmological Club

Chairman: Members rotate alphabetically.
Secretary: Dr. Raymond S. Goux, David Whitney Bldg., Detroit.
Time: 6:30 p. m., first Wednesday of each month.

Eastern New York Eye, Ear, Nose and Throat Association

President, Dr. Edward B. O'Keefe, 901 State St., Schenectady.
Secretary-Treasurer: Dr. W. C. Mott, 118 Washington Ave., Albany.
Time: Third Wednesday in October, November, March, April, May and June.

Fort Worth Eye, Ear, Nose and Throat Society

President: Dr. E. L. Howard, 600 W. 10th St., Fort Worth, Texas.
Secretary-Treasurer: Dr. Van D. Rathgeber, 1012 Medical Arts Bldg., Fort Worth.
Place: Medical Hall, Medical Arts Bldg. Time: 7:30 p. m., first Friday of each month except July and August.

Grand Rapids Eye, Ear, Nose and Throat Society

President: Dr. Carl F. Snapp, 26 Sheldon Ave., Grand Rapids, Mich.
Secretary-Treasurer: Dr. Walter W. Oliver, 320 Medical Arts Bldg., Grand Rapids, Mich.
Place: Various local hospitals. Time: Third Thursday of alternating months, September to May.

Houston Academy of Medicine, Eye, Ear, Nose and Throat Section

President: Dr. E. L. Goar, 1304 Walker Ave., Houston, Texas.
Secretary: Dr. J. C. Dickson, 622 Medical Arts Bldg., Houston, Texas.
Place: Medical Arts Bldg., Harris County Medical Society Rooms. Time: 8 p. m., second Thursday of each month from September to June.

Indianapolis Ophthalmological and Oto-Laryngological Society

President: Dr. D. A. Bartley, 23 E. Ohio St., Indianapolis.
Secretary: Dr. Kenneth L. Craft, 23 E. Ohio St., Indianapolis.
Place: University Club. Time: 6:30 p. m., second Thursday of each month from October to May.

Kansas City Society of Ophthalmology and Oto-Laryngology

President: Dr. M. B. Simpson, 1103 Grand Ave., Kansas City, Mo.
Secretary: Dr. Harold B. Hedrick, 618 Professional Bldg., Kansas City, Mo.
Time: Third Thursday of each month from September to May. The November January and March meetings are devoted to clinical work.

Long Beach Eye, Ear, Nose and Throat Society

Chairman: Dr. Clifford S. Losey, 219 E. 10th St., Long Beach, Calif.
Secretary-Treasurer: Dr. Kenneth C. Brandenburg, 707 Security Bldg., Long Beach, Calif.
Place: Professional Bldg. Time: Last Wednesday of each month from October to May.

Los Angeles Society of Ophthalmology and Oto-Laryngology

President: Dr. F. H. Brandt, 1136 W. Sixth St., Los Angeles.
Secretary-Treasurer: Dr. Pierre Viole, 1930 Wilshire Blvd., Los Angeles.
Place: Los Angeles County Medical Association Bldg., 1925 Wilshire Blvd. Time: 6:30 p. m., fourth Monday of each month from September to May, inclusive.

Louisville Eye, Ear, Nose and Throat Society

President: Dr. Charles Dwight Townes, 332 W. Broadway, Louisville, Ky.
Secretary-Treasurer: Dr. J. S. Bumgardner, 1103 Heyburn Bldg., Louisville, Ky.
Place: French Village. Time: Second Thursday of each month, September to May, inclusive, at 6:30 p. m.

Medical Society of the District of Columbia, Section of Ophthalmology and Oto-Laryngology

Chairman: Dr. George B. Trible, 1801 I St., Washington.
Secretary: Dr. Harry F. Davies, 1835 I St., Washington.
Place: 1718 M St., N. W. Time: 8 p. m., third Friday of each month from October to April, inclusive.

Memphis Society of Ophthalmology and Otolaryngology

Chairman: Each member, in alphabetical order.
Secretary: Dr. R. O. Rychener, Exchange Bldg., Memphis, Tenn.
Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month.

Milwaukee Oto-Ophthalmic Society

President: Dr. O. P. Schoofs, 324 E. Wisconsin Ave., Milwaukee.
Secretary-Treasurer: Dr. Herbert G. Schmidt, 238 W. Wisconsin Ave., Milwaukee.
Place: University Club. Time: 6:30 p. m., fourth Tuesday of each month.

Montreal Ophthalmological Society

President: Dr. J. P. E. Bousquet, 66 Sherbrooke St., West, Montreal, Canada.
Secretary: Dr. J. A. MacMillan, 1410 Stanley St., Montreal, Canada.
Time: Second Thursday of October, December, February and April.

Nashville Academy of Ophthalmology and Otolaryngology

Chairman: Dr. Frederick E. Hasty, 119, 7th Ave. N., Nashville, Tenn.
Secretary-Treasurer: Dr. Kate Savage Zerfoss, 803 Medical Arts Bldg., Nashville, Tenn.
Place: St. Thomas Hospital. Time: 8 p. m., third Monday of each month from October to June.

New Orleans Ophthalmological and Otolaryngological Society

President: Dr. M. F. Meyer, Canal Bank Bldg., New Orleans.
Secretary-Treasurer: Dr. R. H. Fisher, Chess and Checker Club, New Orleans.
Place: Eye, Ear, Nose and Throat Hospital. Time: Third Thursday of each month from October to June.

New York Academy of Medicine, Section of Ophthalmology

Chairman: Dr. Webb William Weeks, 20 E. 53rd St., New York.
Secretary: Dr. Guernsey Frey, 121 E. 60th St., New York.
Time: 8:30 p. m., third Monday of every month from October to May, inclusive.

Omaha and Council Bluffs Ophthalmological and Oto-Laryngological Society

President: Dr. Abbott M. Dean, 532, 1st Ave., Council Bluffs, Iowa.
Secretary-Treasurer: Dr. Robert H. Rasgorshek, 425 Aquila Court, Omaha.
Place: Omaha Club, 20th and Douglas Sts., Omaha. Time: 6 p. m., dinner; 7 p. m., program; third Wednesday of each month from October to May.

Philadelphia County Medical Society, Eye Section

Chairman: Dr. Charles R. Heed, 1205 Spruce St., Philadelphia.
Secretary: Dr. Sidney L. Olsho, 235 S. 15th St., Philadelphia.
Time: Second Tuesday of each month from October to May.

Pittsburgh Ophthalmological Society

President: Dr. Edward B. Heckel, Jenkins Arcade Bldg., Pittsburgh.
Secretary: Dr. George H. Shuman, Park Bldg., Pittsburgh.
Place: Pittsburgh Academy of Medicine Bldg. Time: Fourth Monday of each month, except June, July, August and September.

Pittsburgh Slit-Lamp Society

President: Dr. W. W. Blair, 121 University Pl., Pittsburgh.
Secretary: Dr. George H. Shuman, Park Bldg., Pittsburgh.
Place: 121 University Pl. Time: Second Monday evening of every month, except June, July, August and September.

Richmond Ophthalmological and Oto-Laryngological Society

President: Dr. F. H. Lee, 501 E. Franklin St., Richmond, Va.
Secretary: Dr. William R. Weisiger, Medical Arts Bldg., Richmond, Va.
Place: Westmoreland Club. Time: 6 p. m., second Monday of each month from October to May.

Rochester Eye, Ear, Nose and Throat Society

President: Dr. E. W. O'Brien, 5 N. Goodman St., Rochester, N. Y.
Secretary-Treasurer: Dr. W. D. Edwards, 389 Monroe Ave., Rochester, N. Y.
Place: Rochester Medical Association, 113 Prince St. Time: 8 p. m., third Monday of each month from October to May.

St. Louis Ophthalmic Society

President: Dr. E. C. Spitze, 234 Collinsville Ave., East St. Louis, Ill.
Secretary: Dr. Carl T. Eber, 1006 Carleton Bldg., St. Louis.
Place: Oscar Johnson Institute. Time: Clinical meeting 5:30 p. m., dinner and scientific meeting 6:30 p. m., fourth Friday of each month from October to April, inclusive, except December.

San Antonio Ophthalmolo-Oto-Laryngological Society

President: Dr. Robert E. Parrish, 712 Medical Arts Bldg., San Antonio, Texas.
Secretary-Treasurer: Dr. E. King Gill, 323 Medical Arts Bldg., San Antonio, Texas.
Place: Bexar County Medical Library. Time: 8 p. m., first Tuesday of each month from October to May.

San Francisco County Medical Society, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Robert S. Irvine, 490 Post St., San Francsico.
Secretary: Dr. Frank H. Rodin, 490 Post St., San Francisco.
Place: Society's Building, 2180 Washington St., San Francisco.
Time: Fourth Tuesday of every month except May, June, July and December

Shreveport Eye, Ear, Nose and Throat Society

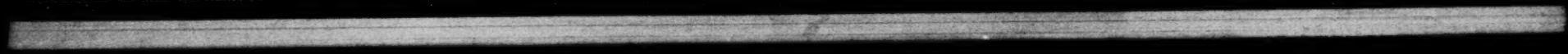
President: Dr. W. L. Atkins, 940 Margaret Pl., Shreveport, La.
Secretary-Treasurer: Dr. Leon F. Gray, 1214 Slattery Bldg., Shreveport, La.
Place: 1240 Texas Ave. Time: 8:15 p. m., fourth Tuesday of every month except June, July and December.

Spokane Academy of Ophthalmology and Oto-Laryngology

President: Dr. Marc Anthony, 422 Riverside Ave., Spokane, Wash.
Secretary: Dr. Raymond A. Lower, 1455 Paulsen Medical and Dental Bldg., Spokane, Wash.
Place: Paulsen Medical and Dental Library. Time: 8 p. m., fourth Tuesday of each month except June, July and August.

Syracuse Eye, Ear, Nose and Throat Society

President: Dr. H. O. Brust, 820 S. Crouse Ave., Syracuse, N. Y.
Secretary-Treasurer: Dr. W. J. Werfelmann, 109 S. Warren St., Syracuse, N. Y.
Place: University Club. Time: Second Friday of each month except June, July and August.

Tulsa Academy of Ophthalmology and Otolaryngology

President: Dr. Roy Dunlap, Medical Arts Bldg., Tulsa, Okla.
Secretary-Treasurer: Dr. Marvin D. Henley, Medical Arts Bldg., Tulsa, Okla.
Place: Medical Arts Bldg. Time: Monthly.